

CONTRIBUTION TO THE TAXONOMY OF ASIATIC WASPS OF THE GENUS *TIPHIA* (SCOLIIDAE)

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INTRODUCTION

Since 1920, workers on the Japanese beetle project of the United States Bureau of Entomology have been searching in the Orient for suitable parasites to introduce into the United States for use against the Japanese beetle in this country. In the course of this work a large amount of material on the genus *Tiphia* was gradually accumulated, and considerable information on the ecology and life history of a number of the species was gathered. Satisfactory determinations of these species, however, could not be obtained. The writers therefore began during the winter of 1926-27 a study of the material accumulated in the Japanese Beetle Laboratory and in the United States National Museum. It was soon found that a considerable number of species was represented. The original descriptions of many oriental forms proved unsatisfactory because most of the characters used in these descriptions appear, in the light of present knowledge, to have little or no diagnostic value. Fortunately, Mr. A. B. Gahan of the Bureau of Entomology was able to spend a few days examining types in the British Museum and comparing them with specimens sent him and with manuscript keys to species, and was able to indicate the identity of several species with previously described forms. In addition to these species, a number of others, new to science, are described in this paper.

The inadequacy of some of the descriptions is probably due in no small measure to the use of inferior optical equipment by the earlier workers on the group. The writers have found the wide field binocular microscope giving a magnification of about 60 diameters and a powerful artificial light almost indispensable for clearly revealing some of the minute characters that have been found most valuable in differentiating species. The large number of reared specimens of

known history at the disposal of the authors has proved a very great boon to basic taxonomic work in this group, and is probably an advantage not enjoyed to so great an extent by any previous workers on the genus.

The external structural characters of the two sexes differ so widely that association on morphological resemblances can safely be made only in isolated cases where some striking character is present in both. The sexes have been correctly associated in several species by rearings from known parentage. A number of species are still known in literature by different names for each sex: such a condition can be eliminated but slowly through rearings and more extensive collecting. Females have been selected as types whenever possible, because this sex possesses more valuable diagnostic characters, and is more important from the point of view of biological control.

This paper is a statement of the writers' present knowledge of the taxonomy of *Tiphia* from Japan, Chosen (Korea), China, and India. A more extended study should be made of the types from this region which are deposited in the museums of Europe, but at present the authors are not in a position to do this. Since considerable biological and economic data are, however, now awaiting publication, it is deemed advisable to pave the way by the publication of this preliminary taxonomic paper.

All of the types of new species described in this paper, along with a large number of paratype specimens, have been deposited in the United States National Museum. Wherever they could be spared, paratypes and determined specimens have been deposited in the British Museum, which, of all institutions, has the largest collection of types of *Tiphia* from eastern Asia. Similar material has been deposited in the collection of the Illinois Natural History Museum, which is rich in North American *Tiphia* worked over several years ago by J. R. Malloch, and in the collection of the Philadelphia Academy of Natural Sciences, which also has a large collection of *Tiphia*. Representative paratypes and much of the material not included in type series have been retained in the collection of the Japanese Beetle Laboratory.

The authors acknowledge the helpful assistance of A. B. Gahan, who not only compared many of their determinations with types, but also allowed them to use his notes on other species found in the British Museum which are not represented in North American collections; of S. A. Rohwer for the use of his notes on *Tiphia* and for helpful criticism; of Dr. J. Waterston, hymenopterist of the British Museum, for comparisons made with types, and for generously proffering the services of the British Museum; and of Dr. J. Masi for comparisons made at the Museo Civico de Storia Naturale, Genoa,

Italy. For additions to the collection of material, thanks are due to Messrs. C. P. Clausen, T. R. Gardner, J. L. King, K. Sato, T. P. Chao, C. Y. Wong, and various Japanese and Chinese assistants. Much helpful assistance has been received from Messrs. J. K. Holloway and R. W. Burrell of the Japanese Beetle Laboratory. Thanks are due also to Messrs. L. B. Smith and J. L. King for their encouragement in the study of oriental *Tiphia*.

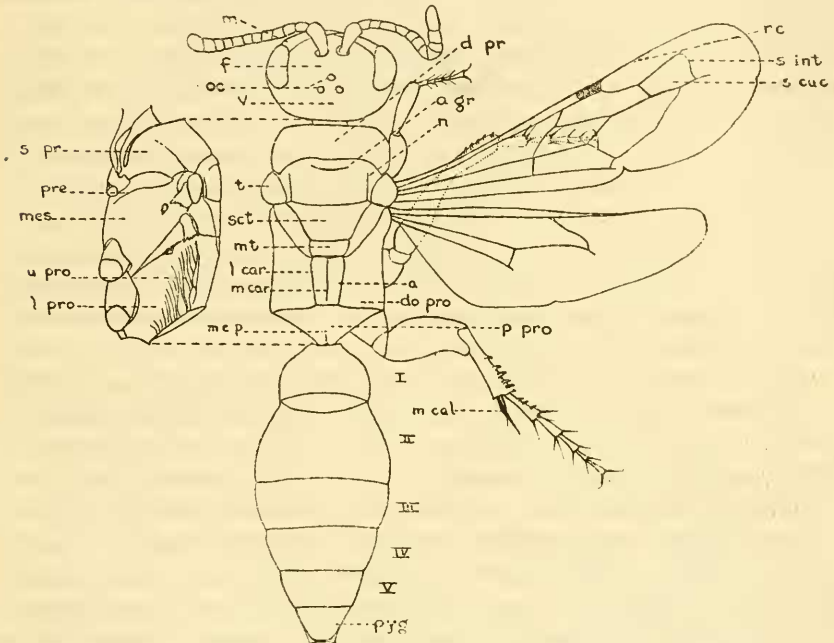


FIGURE 1.—OUTLINE SKETCH OF A FEMALE *TIPHIA* SHOWING DORSAL ASPECT IN TOTO, AND LATERAL ASPECT OF THE THORACIC REGION: *a*, AREOLA; *a gr*, ANTERO-MEDICAL GROOVE OF SCUTUM; *do pro*, DORSAL ASPECT OF PROPODEUM; *d pr*, DORSAL PRONOTUM; *f*, FRONT; *l car*, LATERAL CARINA OF AREOLA; *l pro*, LOWER PORTION OF THE SIDE OF THE PROPODEUM; *m*, MANDIBLE; *m e p*, MEDIAL CARINA OF POSTERIOR ASPECT OF PROPODEUM; *mes*, MESEPISTERNUM; *m cal*, MAJOR CALCARIUM OF THE HIND TIBIA; *m car*, MEDIAL CARINA OF THE AREOLA; *mt*, METATHORAX; *n*, NOTAULI OF SCUTUM; *oc*, OCELLI; *p pro*, POSTERIOR ASPECT OF PROPODEUM; *pre*, PREPECTUS; *pyg*, PYGIDIUM; *rc*, RADIAL CELL; *scut*, SCUTELLUM; *s cuc*, SECOND CUBITAL CELL; *s int*, SECOND INTERCUBITAL VEIN; *s pr*, SIDE OF PRONOTUM; *t*, TEGULA; *u pro*, UPPER PORTION OF THE SIDE OF THE PROPODEUM; *v*, VERTEX

DIAGNOSTIC CHARACTERS

Although a large number of the terms in this paper have been used before in works on *Tiphia* or closely related groups, some uncertainty has developed in regard to the precise meaning of many of the terms employed. For the purpose of avoiding ambiguity, as well as to make the descriptions given of greater value to the student unversed in the taxonomy of Hymenoptera, some space is given in the present paper to the discussion and definition of characters.

Punctuation.—The size, shape, depth, density, and uniformity of distribution of punctures vary greatly between species, and furnish many distinguishing characters in both sexes. In some species the punctures are round; in others they are elongated. The margin may be sharply outlined or vague, and, in one group, each puncture has an extended impressed area surrounding it, suggesting the term “*dimpled*.” There are often two, and sometimes three, distinct sizes of punctures in the same area. When the punctures of such an area are of two sizes the condition is termed *bipunctate*, and the larger punctures are called primary punctures and the smaller are called secondary punctures. When the secondary punctures are very small they are called *minute punctures*. This term is also applied to the smaller punctures in cases where there are secondary punctures of two sizes. The spaces between punctures are termed interspaces.

The primary punctures vary in density, but can be classified in three more or less distinct categories (pl. 2, fig. 9). When punctures are so grouped that each has at least three others nearer to it than the length of its own diameter, the condition is termed *first-degree density*. When the punctures are arranged in rows, each puncture separated from the proximate punctures in the same row by interspaces equal to or shorter than the diameter of the puncture, the condition is termed *second-degree density*. When the punctures are widely scattered, being separated by interspaces greater than their individual diameters, the condition is termed *third-degree density*.

Head.—The *vertex* extends from the occipital declivity to the lowest ocellus. The presence and distribution of certain minute punctures on the vertex, and their size, density, and regularity of distribution are diagnostic in both sexes of several species (pl. 4, fig. 28). The *front* extends from the lowest ocellus to the antennal fossae. In this region the degree of shagreening is diagnostic. In both sexes there are some differences between species in the presence or absence of a *carina* on the medial line just above the antennae; another specific difference is the presence or absence of a shallow *groove* extending along the top of this carina and continued above on the *impunctate stripe* which extends downward from the lowest ocellus. These characters are apparently not always constant within the species. The density of the primary punctures varies greatly between species and is a good diagnostic character, particularly in females. Primary punctures are usually denser on the lower front from eye to eye and, to a more limited extent, along the eye orbits toward the vertex, than elsewhere on the front. They are usually sparse in a region bordering the ocellar triangle below called the *preocellar region*. In the males, the height to which the secondary punctures extend medially and along the eye orbits, and the

degree to which they mingle with the primary punctures are valuable characters.

The density, erectness, and orientation of the hair would be a good character if it were not for the fact that this vestiture is easily rubbed off. The width of the face between the antennal fossa and the eye orbit, termed the *antennocular distance*, varies between species and forms a distinguishing character in males. The most prominent feature of the clypeus is the *median extension*. In the female it is nearly always truncate or faintly emarginate, but in the male the emargination varies sharply between species, and is an excellent character. Another good specific character in both sexes is the extent of the impunctate margin, measured in terms of its proportion to the whole *clypeoantennal distance*, which is the distance from the apex of the extension to the anterior edge of the antennal fossae. This distance is also used as a unit for measuring the *apical width* of the clypeal extension in the males, which is the distance between the two apical points, or, in species with truncate clypeus, of the truncate portion. The *lateral margin* of the clypeus, which includes the distance from the extension to the base of the mandibles, is anteriorly convex in some species (pl. 1, fig. 8), and straight in others.

The only reliable mandibular character in this group is found in the presence or absence of a medial longitudinal groove (pl. 3, fig. 21) in females. Dentation and coloration seem to have little value.

In a number of species of the *koreana* group the third antennal segment is conspicuously reddish. The flagellum is somewhat fulvous underneath in the females of many species, but this is rare in the males. In the males of some species there is a series of rectangular, fulvous spots on the underside of the antennae, extending to the tip.

Thorax.—The degree of shagreening and the size, shape, density, and uniformity of distribution of punctures vary as greatly on the thorax as on the front, and are defined in the same terms. A *transverse carina* separating the dorsal and the anterior aspects of the pronotum is almost always strongly developed in males, but varies enough in females to be a fairly good character if not too rigidly applied. It may be lacking medially and it may have the edge flattened. In the females, the hindmost punctures of the pronotum may be concentrated in a densely punctate, *transverse discal band*. The medial extension of the punctate, anterior portion of the dorsal aspect may be greater or less than that of the impunctate, posterior portion, though this is somewhat unreliable as a character when there is also a narrow, medial, impunctate emargination of the punctate portion.

On the *side of the pronotum* (fig. 1, *s pr*), which lies in a nearly vertical plane, the most valuable character in both sexes is the *groove* which crosses the center of the region from a point near the terminus of the transverse carina to the alar angle. This groove may be entirely absent or it may be present, complete, or only partially developed, straight or broadly curved, deep or shallow, broad or narrow, uninterrupted or crossed at frequent intervals by diagonal rugae. The groove is described as viewed from a position perpendicular to the surface upon which it occurs and not from in front. Punctures on the side are also valuable characters though not often found.

The *scutum* of the female usually has lateral notauli and a separate crescent-shaped *antero-medial groove* (pl. 1, fig. 6). In some species the notauli and the *antero-medial groove* are connected at the antero-lateral corner, and are then termed *continuous* (pl. 1, fig. 5).

The punctures of the *mesepisternum* (fig. 1, *mes*) have diagnostic value in the males. The posterior slope is densely covered with secondary punctures in all species, and this is usually true of a narrow area posterior to the prepectus. The lower disk is usually sparsely punctate at most, but on the upper disk all degrees of bipunctuation occur. Shagreening is also diagnostic. There are a few species in which in both sexes there is a plainly visible groove (pl. 1, fig. 1) adjacent and parallel to the posterior border, sometimes extending upward toward the spiracle on the polished summit called the *subalar callosity*. No trace of this character occurs in most species.

The width of the impunctate apex of the *scutellum* varies among the males, but is rather difficult to define because the actual apex is indefinite.

On the *metanotum* the principal diagnostic characters are the size of the punctures as compared with those of the scutellum and the presence or absence of a medial impression or callosity.

Legs.—The femora and tibiae are usually black, but in the females of some species the femora or the tibiae, or both, are bright red. Such color characters have proved constant for a long series of specimens obtained from one locality, but may not apply so well to specimens taken over a wide geographical or climatic range. The presence or absence of a *longitudinal groove* (pl. 3, fig. 22) on the hind basitarsus is an excellent diagnostic character with the females, and divides the species described in this paper into two nearly equal parts. In the females of some species the larger of the two long spurs on the hind tibia, termed its *major calcarium* (fig. 1, *m cal*), tapers uniformly from the base to the apex (pl. 1, fig. 4), while in other species it is distinctly wider near the middle than at the base (pl. 1, fig. 3). On the outside of the hind basitarsus there occurs a group of specialized spines which range in shape from

straight lanceolate to pricklelike (pl. 3, figs. 22 and 23) and in arrangement from a straight row to an irregular group, with or without one of the same kind of spines at the extreme apex.

Wings.—The tegulae are occasionally much longer than wide. They are usually thick and dense, opaque black, but in some species they become semi-transparent and bright red or brownish. Shagreening is occasionally found, though fainter than on the front. A marginal groove is present in some species, and a faint marginal impression on the outside is even more common. The wings seem to have very few diagnostic characters in the female. In the male, the apical extension of the radial cell varies greatly between species, and is considered to be equal to the second cubital cell when a line drawn from the lower outer angle of the second cubital cell perpendicular to the costa touches the end of the radial cell for a part of its length. It may be either longer (pl. 4, fig. 25) or shorter (pl. 4, fig. 26) than this. Smokiness, associated with distinctness of the hyaline tracings, varies among species, but can not be finely differentiated. A peculiar tracing in the first cubital cell below the stigma is termed the *first cubital mark* (pl. 1, fig. 7). Vein curvatures and ratios of comparison between the lengths of different abscissae appear to be highly variable within the species.

Propodeum.—The principal characters of the propodeum are the shape (pl. 2, figs. 10 to 14), and the length of the *areola* (fig. 1, *a*) or dorsal enclosure, the nature and extent of the carinae, the presence or absence of shagreening, striae, and minute setigerous punctures on the area beneath the parallel rugae on the lower aspect termed the *lower portion of the side* (fig. 1, *l pro*). The conformation of the areola in the male is quite variable within the species, and is therefore unreliable in this sex. The length of the areola is expressed in terms of its width at the anterior limit. The outside carinae may or may not be bordered by grooves. The grooves, when present, may or may not be interrupted by many transverse ridges. When interrupted in this way the groove is called *crenulate*. The *posterior aspect* appears to offer few good characters. Its sculpturing is rather faint and is variable within species, but the length of the medial carina is fairly constant, and is perhaps the best character of this region.

Abdomen.—The first abdominal tergite (fig. 1) furnishes a number of good characters. No median transverse ridge or groove, such as is common in North American species, has been found to occur on any of the Asiatic species examined. In the *koreana* group, however, there occurs a *deep preapical groove* (pl. 2, fig. 15) which is overlapped at the middle, and is an excellent diagnostic character, although apparently easy to overlook because of its proximity to the normal apex of the segment. This groove is always associated with

a peculiar type of dimpled punctures. Patches of dense, minute punctures on the *anterior aspect* and the presence and constitution of the *preapical band* of punctures just before the apex of the tergite are of value in the females. The triangular first sternite may be coarsely punctate, densely and minutely punctate, or impunctate. It has *lateral grooves*, (pl. 4, fig. 31), which are anterior prolongations of the usual posterior transverse fossa. The fossa is frequently crossed by many transverse ridges or *crenulae* and is then termed crenulate. The grooves vary in length from less than one-fourth to three-fourths the length of the sternite, though this character should not be too rigidly applied. Just anterior to the constricted portion of the first sternite there is a shield-shaped sternal sclerite termed the *escutcheon* (pl. 4, fig. 31.)

The tergites of the intermediate abdominal segments offer diagnostic characters in the form of variations in the density and distribution of punctures, the presence or absence of dense, erect, brown pile, of marginal grooves, of vestigial rows of minute punctures (pl. 4, fig. 30), and of apical rows of highly specialized hairs. The impunctate apex varies in width, and is measured in terms of the width of the nearest and largest dorsal primary punctures, without considering the thin, membranous extension of the apex, which is present in many specimens.

The sternites appear to have few useful characters among the females, though in the *bicarinata* group the presence of well differentiated apical rows of hairs is quite constant and conspicuous. In the Asiatic males, nearly all species have the minute *lateral denticle* on the fifth sternite (pl. 4, fig. 27) which readily differentiates them from most of the eastern North American species, in which this character is absent. In some Asiatic males a similar process is developed on the fourth sternite, with possible traces on the segments anterior to the fourth, and in other species a conspicuous orifice is present under the denticle of the fifth sternite.

The *hypopygium* of the female is usually very uniform, but in two species it possesses diagnostic characters in the form of a narrow, median, *impunctate line* (pl. 1, fig. 2). The impunctate line, which is uniformly present in males, has some useful diagnostic characters in its contour and in the nature of the tufts of hair bordering it.

The *pygidium* of the male is of little value for determinations, but in the female (fig. 1, *pyg*) it offers a number of highly valuable specific characters. In most species the punctures are confined to the upper three-fifths, but in some they extend nearly to the tip. In a few species it is entirely and deeply rugose. The apical half may be smooth and highly polished, shagreened, or covered with shallow wrinkles quite different from the rugae mentioned above.

The lower portion of the punctate area may or may not have a central impunctate spot (pl. 4, fig. 32) in the form of an *emargination* of the apical border.

The genitalia of the male (pl. 3, fig. 17) consist of the *first* and *second genital segments* and a number of accessory appendages. On the ventral side of the second genital segment, and more or less closely connected with it, are two pairs of claspers. The larger pair is termed the *outer claspers*, and the smaller pair the *inner claspers*. The second genital segment usually terminates in a downward and inward-twisted process termed the *apical hook*. The *aedeagus* is characterized by a proximal and a distal portion, which are more or less definitely separated by a constriction. On the distal portion *apical lobes* and *lateral processes* are usually differentiated. Very few or no differences have been noted in the genitalia of closely related species of well-defined groups. There are, however, a number of well-marked differences between males of the different groups studied in respect to the conformation of both pairs of claspers, of the apical hooks of the second genital segment, of the degree of angulation or convexity of the inner hind margin from the apical hook to the base of the aedeagus, and in the apical lobe and lateral process of the aedeagus.

Throughout the group there is a marked degree of antigeny. The males are uniformly much smaller than the females. Each sex has specific diagnostic characters not present in the other sex, such as in the wing venation and in the mesepisternal bipunctuation in the male, and in the hind basitarsal groove in the female, but even in the case of such characters as the groove on the side of the pronotum, which is developed in both sexes, there is no fixed degree of correlation.

UNIFORM CHARACTER OF THE GENUS

An effort has been made to use only characters of diagnostic value in the descriptions in this paper. In order to avoid undue repetition, it may be stated here that all species described in this paper possess the following characters, unless otherwise specified.

Female.—Vertex without dense, minute punctures extending dorsally forward from the occipital area. Front with its hairs directed more strongly backward than outward; primary punctures round and deep; surface not shagreened; without medial carina, impunctate stripe, or groove. Clypeus with its lateral margin straight; its extension truncate or only very slightly emarginate; with an impunctate margin defined by an even row of punctures. Mandibles without a median groove between the usual upper and lower grooves. Antenna with its third joint distinctly shorter than its greatest width; first joint not angulate apico-ventrally; flagellum black

throughout. Pronotum not shagreened; with its transverse carina not complete medially. Sides of pronotum without a groove across center, but with fine, anastomosing rugae in ventral angle. Scutum with its notauli and antero-median groove not continuous. Mesepisternum on the posterior slope without a premarginal groove. Metanotum without an apical callosity or median groove or impression. Legs black, except for variable reddish coloration on the less exposed surfaces; without groove on hind basitarsus. Tegula without incised or impressed lines on outside border; inner corner not conspicuously produced or upturned; length not exceeding width; color black and opaque without shagreening. Wings smoky, with first cubital mark not present. Propodeal areola with inclosed areas smooth and free from sculpturing. Lower portion of sides of propodeum without dense, setigerous hairs. Posterior aspect of propodeum coriaceous laterally. First abdominal tergite without a median patch of dense, minute punctures and without a preapical groove that is broadly overlapped in the middle; no dimpled primary punctures on the posterior dorsum. First sternite with dense, minute, setigerous covering on its disk, this covering not considered to be sculpturing. Tergites 2 to 5 without a marginal line or groove extending over the median region, and without dense, erect pile, vestigial apical rows of minute punctures, or other unusual arrangement of punctures as described for various species. Pygidium not longitudinally carinate, with impunctate emargination of the punctate area, and not visibly shagreened on the apical impunctate surface.

Male.—Vertex devoid of a dense patch of secondary punctures extending dorsally; primary punctures of vertex conspicuously denser in a medial patch behind the ocellar triangle than on either side. Front not shagreened, its primary punctures round and deep, of first-degree density except on the preocellar region where they are of third-degree density; without medial carina, groove, or stripe. Impunctate margin of clypeal extension drawn to a thin edge. Antennae entirely black. Pronotum not shagreened, its transverse carina complete and sharply erect. Mesepisternum not shagreened, lacking the premarginal groove along the posterior surface. Legs black. Tegula black, opaque, without shagreening or marginal grooves or impressions. Wings smoky, with the hyaline lines distinct, first cubital mark not present. Tergites without erect, brown pile or margins with linear grooves over the dorsum. First tergite without an antero-median patch of dense secondary punctures. Fifth sternite with lateral denticles beneath which there is no orifice; similar processes not present on preceding sternites. Hypopygial median impunctate stripe of uniform width.

RELATIONSHIPS

As the result of the study of a long series of specimens, some of which are associated with unpublished biological notes, the writers are convinced that within the genus *Tiphia* there are a number of sub-groups of closely related species. This relationship is indicated in the accompanying list of species, in which the *popilliavora* group of five species is possibly the least specialized. Varying in different directions from this central group are other groups, as well as a number of species which we have not yet been able to associate with any group. The other groups which have been recognized are the *koreana* group of eight species, the *rufomandibulata* group of seven species, the *bicarinata* group of four species, the *malayana* group of three species, the *agilis* and the *capillata* groups of two species each, the *vernalis* complex, the species *totopunctata*, which is quite distinct, and nine species, headed by *matura*, which have some points of relationship but are not considered as forming a group of closely related species.

LIST OF SPECIES

<i>Koreana group</i>	<i>Capillata group</i>	<i>Bicarinata group</i>
<i>koreana</i>	<i>capillata</i>	<i>bicarinata</i>
<i>ovidorsalis</i>	<i>levipunctata</i>	<i>brevitneata</i>
<i>antigenata</i>		<i>cilicincta</i>
<i>assamensis</i>		<i>fukiensis</i>
<i>tegitiplaga</i>		<i>Agilis group</i>
<i>autumnalis</i>		<i>ascricae</i>
<i>fossata</i>	<i>Popilliavora group</i>	<i>agilis</i>
<i>communis</i>	<i>popilliavora</i>	<i>vernalis</i>
	<i>phyllophagae</i>	
<i>totopunctata</i>	<i>ovinigris</i>	<i>Miscellaneous species</i>
	<i>inconspicua</i>	<i>matura</i>
<i>Rufomandibulata group</i>	<i>nervidirecta</i>	<i>pullivora</i>
<i>sternodentata</i>		<i>biseculata</i>
<i>singularis</i>		<i>pigmentata</i>
<i>notopolita</i> var. <i>notopolita</i>	<i>Malayana group</i>	<i>clauseni</i>
<i>notopolita</i> var. <i>intermedia</i>	<i>malayana</i>	<i>longitegulata</i>
<i>rufomandibulata</i>	<i>brevistigma</i>	<i>latistriata</i>
<i>sternocarinata</i>	<i>compressa</i>	<i>minutopunctata</i>
<i>brevicarinata</i>		<i>nana</i> (?)
<i>lyrata</i>		

All of the species in which the male is known, except certain members of the *bicarinata* group, have a tooth or an orifice on the side of the fifth sternite. *Cilicincta* and, usually, *bicarinata*, are devoid of sternal denticles which in *fukiensis* are only weakly developed. This deficiency, together with the peculiar apical ciliate rows of bristles on the abdominal segments and the wholly rugose pygidium of the female, distinguishes this group from the others, although the

basitarsal groove indicates greater affinity with the *malayana*, *popilliavora*, and *agilis* groups and with *vernalis* than with the others.

The presence of a basitarsal groove in the female is associated with stout lanceolate spines (pl. 3, fig. 22) on the outside of the basitarsus, terminating in a spine of the same type at the apex. It is also associated with a major calcarium which is distinctly wider near the middle than toward the base, and characterizes the *malayana*, *popilliavora*, and *agilis* groups, the species *vernalis*, and all species listed with *matura* except *nana*, in which the female is not known. In the species lacking the groove, the outside of the basitarsus is armed with spines which are more or less prickle-shaped but lacks a spine of the same type at the apex, and the major calcarium of the hind tibia tapers from the base, or at least is not wider near the middle than at the base.

The *vernalis* complex as a whole is generalized like the *popilliavora* group, differing most noticeably in the male, which has the mesepisternum much less densely beset with secondary punctures, the radial cell far exceeding the second cubital cell, and a peculiar, wedge-shaped, impunctate area on the hypopygium.

The *agilis* group also is somewhat generalized, but differs from the *popilliavora* group in that they are smaller and have the tegula delicate, red, and semitransparent. The mesepisternum of the male is somewhat less densely beset with secondary punctures and the radial cell exceeds the second cubital cell.

In the *malayana* group the sculpturing of the pygidium is characteristic, the pygidium being unusually smooth and free from wrinkles or shagreening on the apical impunctate portion. In *malayana*, the only species of this group in which the male is known, the radial cell far exceeds the second cubital cell and the mesepisternum is comparatively scantily beset with secondary punctures, as in *vernalis*, but the impunctate area of the hypopygium is linear and not wedge-shaped.

In the species listed under *matura* there are few characters of group significance aside from those associated with the grooved basitarsus. *Longitegulata* is a very small species with a peculiar, elongate tegula. Both *biseculata* and *pigmentata* have brightly colored leg segments, but they differ in numerous characters from the red-legged *capillata* group, from each other, and from the species in which there is no bright pigmentation.

The two species in the *capillata* group, although lacking the basitarsal groove, are somewhat more generalized than other known Asiatic species in which this condition exists, and, while they differ

from the species in the groups in which the basitarsal groove is markedly lacking, they may not be closely enough related to each other to comprise a separate group. There are marked differences between the two species in vestiture and density of punctation on the front and the pronotum.

The *rufomandibulata* group is characterized by a uniformly tapering major calcarium of the hind tibia and by the basitarsal spines typical of those species lacking the basitarsal groove. The propodeal areola does not differ much from the generalized *popilliavora* group, except in the five-carinate species *lyrata*. Among the four species of the group in which males are known there is, in this sex, an orifice on either side of the fifth sternite, a character not found in any of the other species listed above in which males are known. It should be noted, however, that in *singularis* and *sternodentata* the radial cell much exceeds the second cubital cell, while it is scarcely equal in the other species. The females of *singularis* and *sternodentata* are not known, and these species have therefore been associated only tentatively with this group.

The *koreana* group is more sharply defined than any of the others. Both males and females have a deep, overlapped groove on the pre-apical dorsum of the first tergite, preceded by dimpled punctures. Although several species in this group have been described previously, this character seems to have been overlooked, probably because the overlapped edge of the groove has been confused with the apical margin of the tergite. The groove can readily be identified by tracing the edge laterally to a point where the groove opens from under the overlapping portion, somewhat anterior to the true apex of the segment. Some, but not all of the species, have peculiar, short, dense, erect, brown pile on the abdomen, which may or may not be present in both sexes and on both tergites and sternites.

The relationships between the Asiatic *Tiphia* and the species native to eastern North America where introductions are being made have not been thoroughly worked out. The authors point out, however, that they have not yet seen any native *Tiphia* resembling those of the *koreana* or the *bicarinata* groups, and that most of the species introduced from the Orient have denticles or orifices plainly visible on the fifth sternite in the male, while very few of the native species are thus equipped. The sternal denticle in the male is a useful point in making preliminary determinations of individuals recovered in the field. The presence of a groove on the hind basitarsus of the female and the variation in elongation of the radial cell of the male occur in local *Tiphia* to about the same extent that they do in the oriental forms.

KEY TO SPECIES: FEMALES

1. Hind basitarsus grooved.....18.
Hind basarsus not grooved.....2.
2. First tergite with a very deep preapical groove overlapped at the middle by its anterior margin; the dorsal punctures shallow and dimpled.....11.
First tergite at most with an impressed preapical band; the dorsal punctures not dimpled.....3.
3. Pygidium deeply punctate or rugoso-punctate on not more than the basal three-fifths.....4.
Pygidium deeply rugoso-punctate three-fourths the distance to its apex; scutum with its notauli and its antero-medial groove continuous.
(9) (Chosen) *totopunctata*, new species.
4. Tibiae black; front devoid of dense appressed hairs directed strongly outward from bases of antennae.....6.
Tibiae bright red.....5.
5. Femora black; front with dense, appressed hair which is directed strongly outward at the base of the antennae... (17) (India) *capillata*, new species.
Femora of last two pairs of legs bright red; front with scanty, erect hairs not directed strongly outward... (18) (India) *levipunctata*, new species.
6. Second intercubital vein straight, joining the radius at a sharp angle; first tergite at most with only a few minute punctures on its medio-anterior aspect.....7.
Second intercubital vein sinuous, joining the radius in a broadly rounded angle; first tergite usually with a broad, median patch of dense, minute punctures on its anterior aspect; tegula nearly black, with two separate marginal grooves, one on the outer and the other on the posterior margin, both terminating in an abrupt, inward directed hook at the outer hind angle..... (13) (Japan, China) *rufomandibulata* Smith.
7. Propodeal areola without additional longitudinal carinae between the usual two lateral and median carinae.....8.
Propodeal areola with an additional longitudinal carina on each side of the median carina, between the median and the lateral carinae.
(16) (Burma, China) *lyrata* Magretti.
8. Dorsal aspect of propodeum without an additional short, transverse carina on each side of the areola and immediately anterior to the transverse carina.....9.
Dorsal aspect of the propodeum with a short carina on each side of the areola as described above..... (15) (China) *brevicarinata*, new species.
9. Anterior, constricted portion of first sternite punctate or coarsely coriaceous, without a definite median keel flanked by deep, short grooves supported on the outside by high, sharp carinae; tegula with a groove or impression, at least on posterior margin.....10.
Anterior, constricted portion of first sternite not punctate or coarsely coriaceous, with a definite keel, flanking grooves, and carinae as described above; tegula without marginal grooves.
(14) (China) *sternocarinata*, new species.
10. Metanotum mostly impunctate; tegula with groove rarely present on the outer margin.
(12) (China) *notopolita*, new species.
Metanotum sparsely and broadly punctate, usually with a median patch of dense, minute punctures; tegula with impression or groove usually present on the outer margin.
(12) (Chosen) *notopolita*, new species, *intermedia*, new variety.

11. Tergites 3 to 5 (sometimes only 3) with erect, brown pile much shorter than the usual hairs.....15.
 Tergites 3 to 5 with only the usual long, irregular, yellow hairs.....12.
12. Posterior slope of the mesepisternum with a premarginal groove parallel to the posterior edge; or if groove lacking, first sternite with its median fossa not crenulate.....13.
 Posterior slope of the mesepisternum without a premarginal groove, though sometimes with a vague impression which resembles a groove in certain lights; first sternite usually with a shallow, crenulate median fossa; pygidium usually with a strong, median, carinate wrinkle.
 (8) (China) *communis*, new species.
13. Punctures at center of tergite 3 much sparser than those caudad or cephalad of that region.....14.
 Punctures at center of tergite 3 scarcely less dense than those caudad or cephalad of that region; secondary punctures of tergites 3 and 4 well differentiated from the primary punctures; first sternite with a deep median fossa.....(7) (Chosen) *fossata*, new species.
14. Median carina of areola nearly obsolete, replaced by irregular punctures, anterior portion expanded laterally; first sternite with a polished, impunctate, longitudinal stripe.....(6) (Chosen) *autumnalis* Rohwer.
 Median carina ending just before apex of the areola, not much expanded anteriorly; first sternite with a longitudinal median row of closely spaced punctures, but without polished, impunctate stripe.
 (5) (Japan) *tegitiplaga*, new species.
15. First tergite with a row of very fine punctures just behind its preapical fold; pygidium not medially carinate, scarcely wrinkled on apical half.
 (2) (Chosen) *ovidorsalis*, new species.
 First tergite without a well defined row of punctures along posterior edge of premarginal fold.....16.
16. Tergites with their brown, pilose areas very dense, and visible from any position, the brown pile abundant on sides as well as on the dorsum of the tergite.....(1) (Chosen) *koreana* Rohwer.
 Tergites with their brown, pilose areas beset with very short or sparse pile, often visible only in profile against a light background, and becoming sparser at the sides.....17.
17. Apical callosity of metanotum densely and minutely punctate; vertex devoid of a dorso-medial row of minute punctures.
 (3) (China) *antigenata*, new species.
 Apical callosity of metanotum without definite, minute punctures; vertex with an irregular row of minute punctures.
 (4) (India) *assamensis*, new species.
18. Pygidium deeply punctate or rugose-punctate on not more than the basal three-fifths.....20.
 Pygidium deeply rugose (not wrinkled) to the apex.....19.
19. Punctures of the pronotum evenly distributed; sixth sternite with a median, longitudinal, impunctate line at least as long as the tapering part of the sclerite.....(27) (Japan, Chosen, China) *bicarinata*, Cameron.
 Punctures of the pronotum much denser on the posterior margin than elsewhere on the punctate portion; median, longitudinal, impunctate line on the sixth sternite shorter than the tapering portion of the sclerite.
 (28) (Chosen) *brevilineata*, new species.
20. Femora of last two pairs of legs black, at least on the outer, exposed parts; tibiae rarely red.....22.
 Femora of the last two pairs of legs wholly bright red.....21.

21. Tibiae usually blackish; preapical band of the first tergite well differentiated; abdominal tergites 2 to 4 without shallow vestigial punctures in a row just caudad of the large, preapical, setigerous primary punctures.
(37) (China) *pigmentata*, new species.
Tibiae red; preapical band of the first tergite not differentiated; tergites with shallow punctures as described above.
(36) (Japan) *biseculata*, new species.
22. Tegula at most only slightly longer than broad.....23.
Tegula nearly twice as long as broad, light red; a small species.
(39) (China) *longitegulata*, new species.
23. Side of pronotum without well-differentiated groove across the center, or, if present, shallow and interrupted at frequent intervals.....33.
Side of pronotum with a well-differentiated groove across the center uninterrupted for a distance at least one-half the length of the sclerite...24.
24. Tegula black and opaque, except along the outer edge, or, if red, not transparent and thin.....25.
Tegula wholly red, very thin, and semitransparent; pygidium with a distinct, apical, impunctate emargination in the basal, rugose half.
(32) (Japan, Chosen) *agilis* Smith.
25. Punctures of the punctate part of the pronotum much larger and denser in a line just anterior to the impunctate area than on the lateral disks of pronotum.....30.
Punctures of the punctate part of the pronotum at most only slightly larger or denser in a line just anterior to the impunctate area than on the lateral disks of pronotum.....26.
26. Pygidium wrinkled and strongly shagreened on impunctate portion; carina of the posterior aspect of propodeum only rarely flattened, with the bordering grooves, if present, vague and interrupted.....29.
Pygidium very smooth and free from wrinkles or shagreening on impunctate portion; carina of the posterior aspect of propodeum usually bordered on each side by a narrow groove, its crest strongly flattened.....27.
27. Dorsal aspect of propodeum without a diagonally longitudinal carina laterad of the lateral areolar carina; sides of pronotum above the groove without numerous, widely separated punctures.....28.
Dorsal aspect of propodeum with a diagonally longitudinal carina laterad of the lateral carina; sides of pronotum above the groove with numerous, widely separated punctures; groove of hind basitarsus vestigial, less than one-fifth the length of the joint.
(26) (Philippines, China) *compressa* Smith.
28. First sternite broadly coriaceous on the constricted base; stigma extending in a broadly rounded curve beyond the point of fusion with the radius; groove of hind basitarsus deep, and at least one-half the length of the joint.....(24) (Borneo, China) *malayana* Cameron.
First sternite not sculptured on the constricted base; stigma abruptly truncate at the point of fusion with the radius; groove of hind basitarsus shallow, vestigial, though nearly half the length of the joint.
(25) (India) *brevistigma*, new species.
29. Frontal punctures mostly of first-degree density; areola at most scarcely more than twice as long as wide; metasternum with only one point to each lateral apex, proximal to the hind coxa.
(34) (India) *matura*, new species.
Frontal punctures of third-degree density at least on upper half; areola nearly three times as long as wide; metasternum with two distinct points to each lateral apex proximal to hind coxa.
(22) (China) *inconspicua*, new species.

30. Front, vertex, and pronotum not shagreened; second intercubital vein strongly curved.....31.
 Front, vertex, and pronotum conspicuously shagreened; second intercubital vein nearly straight; punctures on lateral disks of dorsal pronotum sparse, but nevertheless distinctly primary punctures.
 (23) (China) *nervidirecta*, new species.
31. Vertex with a narrow series of minute punctures extending upward medially from occipital region toward ocelli; lateral disks of dorsal pronotum bearing primary as well as secondary punctures.
 (19) (Japan, Chosen, China) *popilliavora* Rohwer.
 Vertex without minute punctures extending in median line from occipital region toward ocelli; lateral disks of dorsal pronotum bearing sparse punctures, all of which are smaller than the largest primary punctures in the transverse discal band.....32.
32. Transverse discal band of pronotum with several punctures on either side of the medial patch, which are very distinctly larger than those adjacent to them or those in the punctate angle anterior to the tegula; punctures on latero-dorsal disks of pronotum mostly secondary punctures.
 (20) (Chosen, China) *phyllophagae*, new species.
 Transverse discal band of pronotum without a series of several punctures on either side conspicuously larger than the others on the band, all of nearly the same size as those in the punctate angle anterior to the tegula; punctures of latero-dorsal disks of pronotum mostly small primary punctures.....(21) (Chosen) *ovinigris*, new species.
33. Hindmost punctures of tergites 2 to 4 not in separate bands, or, if so, removed medially from the apices by a distance only slightly greater than their width.....36.
 Hindmost punctures of tergites 2 to 4 in well-differentiated bands, at center only one puncture wide, and removed from the apex by several times the width of the band; usually with a narrow, medial area of dense, minute punctures on the anterior aspect of the first tergite.....34.
34. Propodeal areola with nearly parallel sides; metathorax with only minute punctures, which are much smaller than those of the scutellum; preapical band of the first tergite with its medial punctures well separated and definitely outlined.....35.
 Propodeal areola much narrower at the apex than at the base; metathorax with several primary punctures nearly as large as the largest of the scutellum; preapical band of the first tergite with its anterior margin abruptly impressed and its medial punctures more or less coalesced with the impressed area and with indefinite margins.
 (40) (Chosen, Japan) *latistriata*, new species.
35. Lower front not shagreened, with several distinct sizes of punctures intermingled over a broad area, the coarsest primary punctures distinctly of third-degree density.....(41) (China) *minutopunctata*, new species.
 Lower front shagreened, with coarse punctures, mostly of first-degree density, developed to the exclusion of other sizes, though becoming smaller toward the antennal fossae.....(38) (India) *clauseni*, new species.
36. Transverse carina of pronotum lacking for nearly the whole width of dorsal aspect.....38.
 Transverse carina of pronotum complete, or at most with a gap at the center less than half the dorsal breadth of the pronotum.....37.

37. Dorsal aspect of vertex with several minute punctures extending forward in a diminishing series toward ocellar triangle on medial line; mandibles with a shallow, median, longitudinal groove; tegula blackish.

(19) (Japan, Chosen, China) *popilliavora* Rohwer.

Dorsal aspect of vertex without such minute punctures; mandibles devoid of a definite medial, longitudinal groove; tegula thin and red.

(31) (Chosen, Japan) *asericae*, new species.

38. Medial carina on posterior aspect of propodeum complete or nearly so; impunctate apex of pronotum usually with one or more short, shallow, medial, longitudinal grooves.....(33) (Chosen, China) *vernalis* Rohwer.

Medial carina on posterior aspect of propodeum absent or very short.

(35) (India) *pullivora*, new species.

KEY TO SPECIES: MALES

1. Fifth sternite with a denticle or orifice on each side.....3
Fifth sternite without a denticle or orifice on each side.....2
2. Radial cell not exceeding second cubital cell, or at most only slightly; punctures on pronotum dense, coalescing in places.

(27) (Chosen) *bicarinata* Cameron.

Radial cell greatly exceeding the second cubital cell; punctures on pronotum sparse and well separated.....(29) (China) *cilicincta*, new species.

3. First tergite without a deep preapical groove overlapped at its middle, at most with an impressed preapical band of punctures; no dense, short, erect, brown pile on dorsum of abdomen.....6
First tergite with a deep preapical groove broadly overlapped at its middle; dense, short, erect, brown pile dorsally on segments 3 to 5.....4.

4. Sternites 2 to 5 clothed apically with dense, erect, brown pile; third antennal segment reddish.....(8) (China) *communis*, new species.
Sternites devoid of dense, erect, brown pile on their apices.....5.

5. Sixth tergite with the short, erect, brown spinules at most scarcely more numerous than the long, irregular, yellowish hairs; the brown spinules not present on the vertical sides of the intermediate tergites.

(2) (Chosen) *ovidorsalis*, new species.

Sixth tergite with the short, erect, brown spinules at least as numerous as the long, irregular, yellowish hairs; the brown spinules densely distributed on the vertical sides of the intermediate tergites as far as the lateral margins.....(3) (China) *antigenata*, new species.

6. Fifth sternite without an orifice beneath the inner edge of the denticle...9.
Fifth sternite with a deep orifice beneath the inner edge of the denticle...7.
7. Radial cell at most only slightly exceeding the second cubital cell.....8.
Radial cell greatly exceeding second cubital cell.

(11) (China) *singularis*, new species.

8. Denticle of fifth sternite unusually large; tergites lacking apical row of vestigial punctures behind the row of large, setigerous apical primary punctures; metathorax densely beset with coarse punctures nearly equaling the largest of the scutellum; a very large species.

(10) (Chosen) *sternodontata*, new species.

Denticle of fifth sternite of ordinary size; tergites with apical row of vestigial punctures or a linear groove behind the row of large, setigerous apical primary punctures; metathorax partially impunctate, the sparse punctures much smaller than the largest punctures of the scutellum; a small species.....(13) (China) *rufomandibulata* Smith and

(12) (China, Chosen) *notopolita*, new species.

9. Lower front masked with abundant, long, appressed, white hair which is more strongly directed laterally than posteriorly on lower half of front; flagellum mostly fulvous.....(17) (India) *capillata*, new species.
Lower front not masked; hairs, when long, are sparse, erect, and scarcely visible when viewed from in front, or, if appressed, very short, and usually directed more strongly posteriorly than laterally; flagellum usually wholly black.....10.
10. Mesepisternum bipunctate over the entire upper half, the minute punctures everywhere within this area at least as numerous as the primary punctures.....18.
Mesepisternum with the extreme outer, convex surface of the upper half at most only sparsely bipunctate, the minute punctures on this region much less numerous than the primary punctures.....11.
11. Radial cell exceeding second cubital cell.....13.
Radial cell at most only equaling second cubital cell.....12.
12. Segments 2 to 6 of the abdomen with apical rows of brownish hairs well differentiated from the coarse, sparse, white hairs; a large species.
(27) (Chosen) *bicarinata* Cameron.
Segments 2 to 6 of the abdomen without apical rows of coarse, brownish hairs; mesepisternum with punctures not clearly outlined; a small species.....(35) (India) *pullivora*, new species.
13. Tegula not distinctly longer than broad.....14.
Tegula twice as long as broad....(39) (China) *longitegulata*, new species.
14. Upper portion of the sides of the propodeum strongly rugose, and sharply defined from the nonrugose lower portion; punctures of the second tergite moderately large.....15.
Upper portion of the sides of propodeum almost devoid of rugae, and not sharply defined from the lower portion; punctures of the second tergite extremely small, scarcely visible.....(42) (China) *nana*, new species.
15. Impunctate medial stripe on sixth sternite linear, or slightly wider anteriorly; tergites strongly shagreened.....16.
Impunctate medial stripe on sixth sternite wedge-shaped, with its apex directed cephalad; tergites at most very faintly shagreened.
(33) (Chosen, China) *vernalis* Rohwer.
16. Intermediate abdominal segments without apical ciliate belts of coarse hairs; first cubital mark not present.....17.
Intermediate abdominal segments each with apical belts of very coarse cilia clearly differentiated from the ordinary, irregular hairs; first cubital mark clearly defined.....(30) (China) *fukiensis*, new species.
17. Legs mostly ferruginous; preocellar area broad, with impunctate interspaces broader than an ocellus; tergites with the impunctate apices scarcely wider than the largest adjacent primary punctures.
(24) (Chosen, China) *malayana* Cameron
Legs black; preocellar area limited without impunctate interspaces as broad as an ocellus; tergites with impunctate apices at least four times the width of largest adjacent primary punctures.
(34) (India) *matura*, new species.
18. Dense secondary punctures of sides of front confined to lowest third, if present.....19.
Dense secondary punctures on sides of front extending upward over lower two-thirds of front....(19) (Japan, Chosen, China) *popilliavora* Rohwer.

19. Clypeoantennal distance scarcely greater than the width of clypeal extension at its apex.....20.
 Clypeoantennal distance twice as great as the width of the clypeal extension at its apex.....(20) (Chosen, China) *phyllophagae*, new species.
20. Pronotum not shagreened.....21.
 Pronotum conspicuously shagreened....(35) (India) *pullivora*, new species.
21. Apical half of first sternite without dense, minute punctures.....22.
 Apical half of first sternite with dense, minute punctures.
 (36) (Japan) *biseculata*, new species.
22. Front with its secondary punctures not extending medially above lower half; antennocular distance equal to or greater than width of antennal fossa.....23.
 Front with moderate number of secondary punctures extending medially nearly to lowest ocellus; antennocular distance distinctly less than width of antennal fossa.....(34) (India) *matura*, new species.
23. Denticle on sixth sternite of usual size, its elevated edge more than half as long as the median width of the punctate portion of the sternite; tegula bright red, thin and semitransparent.....24.
 Denticle on sixth sternite very small, its elevated edge not half as long as the median width of the punctate portion of the sternite; tegula more or less castaneous, thick, and opaque; secondary punctures of mesepisternum everywhere well differentiated from the much larger primaries, and much more numerous.....(22) (China) *inconspicua*, new species.
24. Preapical band of the first tergite laterally with its dorsal punctures separated from each other by interspaces wider than width of punctures, and somewhat distinct from the rather shallowly impressed anterior portion of the band.....(32) (Japan, Chosen) *agilis* Smith.
 Preapical band of first tergite laterally with its dorsal punctures separated from each other by interspaces narrower than width of punctures, and extensively coalesced with the deep, narrow, medial, impressed portion of the band.....(31) (Chosen) *asericae*, new species.

1. *TIPHIA KOREANA* Rohwer

Tiphia koreana ROHWER, Proc. Ent. Soc. Wash., vol. 29, p. 19, 1927.—
 CLAUSEN, KING, and TERANISHI, U. S. Dept. Agr. Dept. Bull. 1429, p. 42, 1927.

The following supplementary notes may be helpful in fixing this recently described species among those discussed in this paper. Female with primary punctures on vertex more sparse medially than on either side. Clypeus with its lateral margin strongly convex. Third joint of antenna distinctly longer than broad. Metanotum with a minutely punctate apical callosity, elsewhere with coarse punctures nearly as large as those of the scutellum. Mesepisternum with a well-developed marginal groove on its posterior slope. First tergite with its dorsal punctures dimpled; with a deep preapical groove overlapped at the middle. First sternite with a crenulate median groove; lateral groove on posterior half. Tergites 3 to 5 with conspicuous bands of dense, short, reddish pile, well differentiated from the long, sparse, white hairs, and extending to the lateral

margins of the tergites. Pygidium without a median impunctate emargination of the punctate upper portion. The male is not known.

Distribution.—Keikido, Chosen.

In the collection of the Japanese Beetle Laboratory are to be found the following: Two females, Suigen, Chosen, August 1 and 2, 1925 (Sato), Gardner No. 2, and 3 females, Suigen, Chosen, July, 1926 (Gardner), Gardner No. 2. Single specimens from the same lots have been deposited in the British Museum and in the collections of the Illinois Natural History Survey and the Philadelphia Academy of Natural Sciences.

2. TIPHIA OVIDORSALIS, new species

Female.—Vertex with primary punctures of first-degree density in limited areas between and just behind the ocelli and near the upper orbits of the inner eye, elsewhere of third-degree, with irregular impunctate spaces. Front faintly shagreened below, with impunctate stripe and groove; primary punctures of lower front scarcely more dense medially than toward either eye, of first-degree density just above base of antennae, along the impunctate stripe to lowest ocellus, and along orbits of inner eye, with a vague, trident-shaped area where primary punctures are lacking or of second-degree density. Clypeus with its lateral margin strongly convex; extension with impunctate apex limited above by coarse punctures not in a regular transverse row. Antenna with its third joint distinctly longer than its greatest width. Pronotum sometimes faintly shagreened, with the transverse carina complete but low across the dorsum; primary punctures in a vaguely defined transverse discal band, scarcely less dense on lateral disks than medially, largely of second-degree density; secondary punctures sparsely scattered on anterior half; punctate area medially of greater longitudinal extension than the impunctate. Side of pronotum with a groove in the center about one-fourth the length of the sclerite, preceded by several short gouges or round punctures. Mesepisternum with a well-developed premarginal crease or groove along its posterior border. Metathorax with a minutely punctate apical callosity, and on either side with coarse primary punctures which are nearly as large as those of the scutellum. Legs with the major calcarium of the hind tibia usually tapering from the base; hind basitarsus with one or two prickle-shaped spines on the outside, but none of the same type at the apex. Tegula with a narrow, abruptly thickened posterior margin. Wings very smoky. Propodeal areola keystone-shaped, one and two-thirds to two times as long as wide; lateral carina bordered on outside by interrupted grooves; medial carina tapering

from a broad base to its apex, one-half to two-thirds the distance to posterior margin; inclosed area faintly shagreened. Dorsal aspect of propodeum outside of areola with sparse, round primary punctures. Lower portion of sides of propodeum polished and minutely setulo-punctate on posterior half. Posterior aspect of propodeum with a few shallow punctures on upper disk; carina on lowest fourth or less. Fourth tergite without preapical band, but with a deep preapical groove broadly overlapped at the middle, though not to the extent of covering the dorso-medial apex; primary punctures dimpled dorsally; a row of minute punctures visible on dorsum just behind the edge of the folded groove. First sternite with a lateral groove on posterior half, and with shallow punctures anteriorly. Tergites 2 to 5 with marginal incised lines; tergites 3 and 4 dorsally with dense secondary punctures, from which arise stiff, short, erect, brown hairs best seen in profile and entirely lacking on the sides. Pygidium sparsely reticulo-punctate, sometimes faintly carinate; impunctate emargination small; apical impunctate portion longitudinally wrinkled and plainly shagreened; sting sheaths and palps not protruding while in repose. Length, 8 mm.

Male.—Clearly resembles the male of *antigenata* from which it differs in the following characters. Vertex with primary punctures back of ocelli largely of third-degree density, usually sparsely beset with minute punctures. Front with poorly defined medial impunctate stripe and vestigial groove; preocellar region of front with sparse primary punctures of second and third degree density, with several interspaces as broad as an ocellus. Primary punctures of pronotum largely of third-degree density, with slight tendency toward series of second degree. First tergite with its preapical fold terminating well before the apex of the segment, well flattened apically, and followed by a row of very small punctures not covered by the fold at any point on dorsum; dimpled punctures separated from apex of fold by at least several times their average diameters. Impunctate margins of intermediate tergites at most three times as wide as adjacent primary punctures. Length 5 to 6 mm.

Distribution.—Keikido, Chosen.

Type and allotype.—Cat. No. 41774, U.S.N.M. Type, female, Suigen, Chosen, August 18, 1925 (Sato), Gardner No. 10. Allotype, male, Suigen, Chosen, Jap. Beetle Par. Exp. 318.

Paratypes.—All from Suigen, Chosen. In the United States National Museum: One female, August 3, 1925 (Sato); 1 female August 23, 1925 (Sato); 3 females, August, 1926 (Gardner), all labeled "Gardner No. 10"; 1 female, no date; 4 females, Jap. Beetle Par. Exp. 318. In the collection of the Japanese Beetle Laboratory: One female, August 26, Gardner No. 10, and 1 male, Jap. Beetle Par.

Exp. 318. Deposited in the British Museum: One female, August 4, 1925 (Sato), Gardner No. 10, and 1 male, Jap. Beetle Par. Exp. 318. Deposited in the collection of the Illinois Natural History Survey: One female, Jap. Beetle Par. Exp. 318. Deposited in the collection of the Philadelphia Academy of Natural Sciences: One female, August, 1926 (Gardner), Gardner No. 10.

Those specimens bearing label "Jap. Beetle Par. Exp. 318" (Japanese Beetle Parasite Experiment 318) were reared from females collected in Chosen, the males thus obtained being from known females.

The species *ovidorsalis*, *koreana*, and *antigenata* are the only ones as yet studied in which the very characteristic erect brown pile has been found in the female. *Ovidorsalis* differs from *koreana* in having the brown pile confined to the dorsal part of the tergite, and from *antigenata* in having the premarginal groove of the first tergite less strongly overlapped, with fine punctures visible behind the edge of the fold. In specimens used in breeding work at Suigen, Chosen, in August, 1926, the premarginal groove of the mesepisternum is reduced to a hair-fine crease or is even lacking altogether. One female of this lot which has no fine, erect brown pile on the dorsum is referred to this species because of information obtained from biological studies and because the conformation of the first tergite is typical of the species.

3. TIPHIA ANTIGENATA, new species

Female.—Vertex with primary punctures of first degree density everywhere except in limited areas on either side of postocellar patch. Front polished; groove vaguely defined; primary punctures densely and irregularly distributed, their outlines elongated toward ocelli; medially on anterior half the combined area of primary punctures exceeds that of their interspaces, but laterally from this place they become much sparser, everywhere of first degree density except on vaguely trident-shaped area below ocellar triangle. Clypeus with its lateral margin slightly convex; extension with its apex impunctate except for minute punctures; impunctate area defined by coarse punctures, not limited by regular transverse row, its longitudinal extension equal to about one-fourth the distance from apex to base of antennae. Antenna with its third joint distinctly longer than broad. Pronotum with the transverse carina complete and strongly developed; primary punctures well differentiated from the secondaries, evenly distributed, mostly of first-degree density, with no distinct transverse discal band; secondary punctures include a very few punctures in the antero-medial area; longitudinal extension of the punctate area medially about equal to that of the im-

punctate area. Side of pronotum with numerous punctures along the anterior borders and in a small depressed patch medially in front of the tegula. Mesepisternum with a well defined premarginal groove on its posterior slope. Metanotum with apical callosity more or less densely beset with minute punctures, the largest somewhat smaller than those of the scutellum. Legs with major calcarium of hind tibia uniformly tapering; hind basitarsus without a groove, a group of two pricklelike spines on outside beyond middle but none at apex. Tegula without impressed line on the outside but with a short, incised line on lower inner margin. Wings moderately smoky. Propodeal areola convergent, keystone-shaped, twice as long as wide; lateral carinae with a bordering groove on the outside; median carina broadening anteriorly, two-thirds the length of areola. Lower portion of sides of propodeum polished, posterior half densely setulopunctate. Posterior aspect of propodeum with a few scattered punctures on the upper margin; median carina developed on less than lower half. First tergite with dorsal punctures dimpled, without a preapical band, but with a deep preapical groove broadly overlapped dorsally. First sternite vaguely rugose, but lacking definite primary punctures; lateral grooves on posterior half. Tergites 3, 4, and 5 with well defined marginal incised line, tergites 3 and 4 with dense secondary punctures on basal half, but lacking erect, brown hairs. Pygidium not carinate, sparsely and irregularly punctate, without well-defined impunctate emargination of punctate basal portion; impunctate apex with many wrinkles converging below, and strongly shagreened. Length, 9.5 mm.

Male.—Vertex with primary punctures back of ocelli of first degree density. Front with primary punctures moderately large, of first-degree density medially below middle and laterally to vertex, of uniform second-degree density in preocellar region; primary punctures displaced almost completely on lower third by dense secondary punctures which extend upward in the interspaces as far laterally as medially, about half way to lowest ocellus. Antennocular distance much greater than width of antennal fossa. Clypeal extension with its apical width four-fifths the clypeo-antennal distance; apex shallowly emarginate without impunctate margin. Flagellum with a narrow fuscous stripe beneath. Pronotum with primary punctures large, deep, round, of first-degree density, and evenly distributed; a few widely scattered secondary punctures. Side of pronotum with a series of overlapping rugae extending from ventral corner one-third to three-fourths distance to alar angle; primary punctures extending down from dorsum along entire length of the plate. Mesepisternum with moderately large, round, primary punctures of vague outline, mostly of second-degree density; secon-

dary punctures usually less numerous than primaries except on posterior slope, sparse on upper disk, almost lacking ventrally, a deep groove or abruptly impressed line of demarcation extending along the posterior border to the spiracle. Scutellum variable. Metanotum with apical callosity; primary punctures of first-degree density and nearly as large as those of the scutellum. Wings with the radial cell equalling the third cubital cell. Propodeum with the areola keystone-shaped, about one and one-fourth to one and one-half times as long as wide, carinae highest and thickest at apex of areola, median carina usually confined to upper half of areola, interspaces flat and polished; dorsum outside areola with sparse primary punctures; posterior aspect finely setulose and densely rugose-punctate without round primary punctures, with a median carina on lower half or less. First tergite beset with large, dimpled primary punctures, those at the apex usually separated from edge of fold by a distance not greatly exceeding the average diameter of primary punctures; without preapical band, but with a deep preapical overlapped groove thickened apically and largely concealing a row of vestigial apical punctures. First sternite vaguely punctate, anteriorly without a definite median keel; apical fossa crenulate; lateral grooves on lower third or less. Tergites 3 to 5 with dense, erect, short, brown pile extending in abundance to lateral edges of tergites; tergite 6 somewhat less densely brown-setulose; no impunctate margin at apex of segments; marginal incised line complete over the dorsum. Sternites with the usual whitish pile but lacking the dense, erect, short, brown pile found on the dorsum. Length, 7 to 8 mm.

Distribution.—Kiangsu, China.

Type and allotype.—Cat. No. 41775, U.S.N.M. Type, female, and allotype, male, Penniu, China, Insectary Reared No. 205.

Paratypes.—Retained in the collection of the Japanese Beetle Laboratory: One male and one female, Penniu, China, Insectary Reared No. 205. Deposited in the collection of the British Museum: One female, Kuliang, China, August 16, 1926 (Jen), and 1 male, Penniu, China, Insectary Reared No. 205. Deposited in the collection of the Illinois Natural History Survey: One female, Kuliang, China, August 16, 1926 (Jen), and 1 male, Kuliang, China, 1926 (Jen). Deposited in the collection of the Philadelphia Academy of Natural Sciences: One female, Kuliang, China, August 16, 1926 (Jen), and 1 male, Kuliang, China, 1926 (Jen). Deposited in the U. S. National Museum: One male, 6C-1, emerged June 5, 1926, and 3 males, Kuliang, China, 1926 (Jen).

The specimens labelled "Insectary Reared No. 205" were the progeny of females collected in China. In the rearing work, the females of this species were not completely segregated from *communis*

and *popilliavora*, but the biological and anatomical characters were sufficiently different to permit of subsequent segregation and to insure the association of males and females with a reasonable degree of certainty.

4. *TIPHIA ASSAMENSIS*, new species

Female.—Vertex densely punctate with elongated punctures which vary irregularly from first to second-degree density, but which are densest between ocelli and at the upper inner corners of the eyes; a few minute punctures on dorso-medial line extending nearly to ocellar triangle. Front shagreened below, with pronounced impunctate stripe and groove; primary punctures large and elongated upward, everywhere of first-degree density save in limited areas around lowest ocellus where they are of second-degree density, about equally distributed between the eyes below. Clypeus with convex lateral margin; extension with its margin impunctate save for scattered, minute punctures. Longitudinal extension one-third distance front apex of clypeus to base of antenna. Antenna with third joint distinctly longer than greatest width. Pronotum with its carina complete and very sharply erect; primary punctures large and elongated, everywhere of first-degree density, without trace of discal band or of sparseness on lateral disks; secondary punctures lacking; longitudinal extension of punctate area medially less than the impunctate area. Side of pronotum with the usual ventral striations becoming deeper near center, but not developed as an unbroken groove for as much as half the length of sclerite. Mesepisternum with a well defined premarginal groove on the posterior slope. Metasternum with an impunctate apical callosity and numerous coarse primary punctures nearly as large as the primary punctures of the scutellum. Legs with the major calcarium of the hind tibia tapering from the base, without a sharp bend near the middle; hind basitarsus on outside with row of two spines terminating before the apex. Tegula without line on the lateral margin, but with a shallow, incised line on posterior margin. Propodeal areola hastate, strongly convergent, one and one-half times as long as wide; lateral carinae with interrupted bordering grooves on the outside anteriorly; medial carina developed on the upper half or less; enclosed area unusually flat and highly polished. Lower portion of sides of propodeum with minute, setulose punctures on lower half. Posterior aspect of propodeum densely hairy, with scattered punctures on upper disk; carina sharply elevated on lower half or less. First tergite without preapical band, but with deep preapical groove broadly overlapped at the middle, and with dimpled punctures on the dorsum. First sternite occasionally with a prominent, crenulate medial groove; lateral grooves on posterior fourth; disk faintly and wavily wrinkled.

Tergites 3 and 4 with dense secondary punctures which merge with the sparse primary punctures apically; impunctate margins at center at least three times the width of adjacent primary punctures, laterally with deep, incised marginal lines which become faint rows of very minute vestigial punctures over the dorsum on these two segments. Pygidium on basal half coarsely rugose, without impunctate emargination of the punctate base; apical impunctate section vaguely carinate, with pronounced wrinkles and shagreening; stylet and sting palps not prominently protruding. Length 8 to 10 mm.

Male.—Not known.

Distribution.—Assam, India.

Type.—Cat. No. 41776, U.S.N.M. Female, Shillong, India, May, 1927 (Clausen). Clausen No. 2056.

Single females of the same lot as the type have been deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences. The remaining eight specimens, also labeled like the type, are retained in the collection of the Japanese Beetle Laboratory.

The female of this species differs from the female of the closely related *antigenata* in having a dorso-medial row of minute punctures on the vertex, in having the width of the apex of the propodeal areola less than half the greatest width of the areola, and in having a shorter, narrower medial carina in the propodeal enclosure. Unfortunately, this species is represented by a small series of more or less fungus-covered specimens, in which the best specimen by far is atypical in having a wider, longer medial carina in the propodeal areola, a carina on the lower half of the posterior aspect of the propodeum, and a crenulate median groove on the first sternite.

5. TIPHIA TEGITIPLAGA, new species

Female.—Vertex with primary punctures of first-degree density between and on either side of ocelli, of third-degree density back of ocelli, and still sparser on either side. Front polished, with interrupted groove; primary punctures becoming shallower above, rather regularly distributed, except that they are somewhat denser on the lower half where they are slightly more closely grouped medially, everywhere of first-degree density except in a vaguely defined area bordering the ocellar triangle below. Clypeus with its margin slightly convex; apex not entirely impunctate, the punctures extending irregularly almost to apical margin. Antenna with third joint distinctly longer than its greatest width. Pronotum with its transverse carina completely and strongly developed; primary punctures mostly of first-degree density, evenly distributed, with no transverse discal band; secondary punctures almost lacking; longitudinal extension of the punctate area medially slightly less than the impunc-

tate. Side of pronotum with more or less distinctly separated punctures in a band posterior to carina and narrowly along dorsal border. Scutum with its notauli and anterior medial groove continuous or nearly so and its punctures evenly distributed. Mesepisternum with a well-developed premarginal groove on its posterior slope. Metanotum with a vestigial apical callosity, elsewhere densely and coarsely punctate, the primary punctures scarcely smaller than those of the scutellum. Legs with major calcarium of hind tibia uniformly tapering; hind basitarsus on the outside with a series of two lanceolate spines, but none of the same type at the apex. Tegula with the inner hind angle somewhat produced and upcurled, with densely pilose hairs. Wings moderately smoky. Propodeal areola hastate, strongly convergent, twice as long as wide; carinae low, bordered by irregular grooves; median carina much wider anteriorly and not quite complete. Lower portion of sides of propodeum polished, striate, posterior third minutely setulo-punctate. Posterior aspect of propodeum densely reticulo-punctate; median carina developed on lowest fourth. First tergite with its larger punctures dimpled; without preapical band, but with a deep preapical groove overlapped at the middle. First sternite flat and polished, with a shallow median groove crossed by short, transverse ridges, and a lateral groove on the posterior half; with scattered, shallow punctures on the anterior half. Tergites 2, 3, and 4 with marginal incised lines but lacking areas of dense secondary punctures or very short, erect, brown pile. Pygidium coarsely reticulo-punctate on basal three-fifths; without a well differentiated impunctate emargination of the punctate base; apex faintly shagreened below the punctures and longitudinally wrinkled at the sides. Length, 10.5 mm.

Distribution.—Shizuoka, Kanagawa, Japan.

Type.—Cat. No. 41777, U.S.N.M. Female, Miho, Japan, October 1, 1926.

Paratypes.—In the collection of the Japanese Beetle Laboratory: One female, Miho, Japan, October 1, 1926. Deposited with the British Museum: One female, Miho, Japan, October 1, 1926. Deposited in the United States National Museum: One female, Yokohama, Japan, July 17, 1920 (Clausen), Clausen No. 1382.

One male from Morioka, Japan, August 20, 1920 (Clausen), in the United States National Museum belongs in the *koreana* group, and may be the male of this species.

6. *TIPHIA AUTUMNALIS* Rohwer

Tiphia autumnalis ROHWER, Proc. Ent. Soc. Wash., vol. 26, p. 88, 1924

The following notes supplementary to the original description will aid in fixing the species. Vertex with small patches of punctures of

first-degree density between and on either side of the ocelli, those immediately behind the triangle rather sparse and irregular, and not more dense than on either side. Lateral margin of clypeus convex. Third antennal joint longer than greatest width. Metathorax with vestigial apical callosity, its punctures coarse and at least half as large as the largest on the scutellum. Propodeal areola hastate in outline, two and one-fourth times as long as its greatest width. First tergite with a deep preapical groove broadly overlapped on the dorsum and with dimpled punctures. First sternite with a wide, polished, impunctate median stripe flanked by dense, minute punctures and sparse, round primary punctures; lateral groove obsolete. Tergites two to four without large patches of dense secondary punctures or of erect, short, brown pile; with strong premarginal grooves over the dorsum.

Male.—Not known.

Distribution.—Keikido, Chosen; Iwate, Japan.

Deposited in the collection of the British Museum: One additional specimen from Kowai, Japan, August, 1926.

This species is referred to by Mr. Clausen under his number 1385.

7. TIPHIA FOSSATA, new species

Plate 1, fig. 1

Female.—Vertex with primary punctures scarcely denser medially than on either side, everywhere of second-degree or third-degree density except small patches near upper portion of eyes and between ocelli. Front polished; primary punctures densely and irregularly distributed; medially, on anterior half, the combined area of primary punctures exceeding that of their interspaces, but from this place becoming scattered and of second-degree and third-degree density. Clypeus with its lateral margin slightly convex; apex impunctate for one-fourth the distance to base of antennae, except for extremely minute punctures. Antenna with the third joint distinctly longer than broad. Pronotum with its transverse carina strongly developed except for a narrow gap in the middle; primary punctures very well differentiated from the secondary punctures, densely and evenly distributed over the whole punctate area, no transverse discal band; secondary punctures sparse and confined to anterior median area; a narrow but distinct median impunctate stripe; the median longitudinal extension of the punctate area distinctly greater than that of the impunctate area. Side of pronotum with upper surface polished, striate, with numerous well separated, round punctures along the upper border. Mesepisternum with a strong premarginal groove on its posterior slope. Metanotum densely double-punctate, punctures

as large as those of the scutellum. Legs with major calcarium of hind tibia uniformly tapering; hind basitarsus with a group of 3 to 5 small, pricklelike spines on outside near middle, no similar ones at apex. Tegula with inner hind corner slightly produced and upcurled, densely hairy. Wings moderately smoky. Propodeal areola hastate, strongly convergent, from two to two and one-half times as long as wide, apex one-third as wide as greatest basal width; lateral carinae not well defined externally; median carina lacking; enclosed area strongly arched and very irregularly punctate. Lower portion of sides of propodeum polished, striate, posterior half densely setulopunctate. Posterior aspect of propodeum with a few scattered punctures antero-medially, no median carina. First tergite with the larger dorsal punctures dimpled; deep preapical groove overlapped at center; lacking a preapical band. First sternite with polished, shallow medial groove; disk on either side with shallow, irregular primary punctures; no lateral groove. Intermediate abdominal segments with tergites 2, 3, and 4 bearing very strong preapical incised lines; tergites 3 and 4 with dense secondary punctures clearly differentiated from the large primary punctures, and without short, erect, brown hairs differentiated from the usual pale hairs. Pygidium coarsely reticulo-punctate on basal three-fifths, apex longitudinally wrinkled near punctures and transversely at the margin. Length, 15 mm.

Male.—Not known.

Distribution.—Keikido, Chosen.

Type.—Female, Cat. No. 41778, U.S.N.M., Suigen, Chosen, August, 1926. (T. R. G.) Gardner No. 14.

Paratype.—Female, of same date, locality, and number, retained in collection of the Japanese Beetle Laboratory.

This species very closely resembles *autumnalis*, from which it differs in having the secondary punctures on dorsa of the tergites denser and extending over a much wider area. Specimens of this species were mixed with the very different *totopunctata* in the lot under Gardner's note No. 14.

8. *TIPHIA COMMUNIS*, new species

Plate 1, figs. 4, 8; plate 2, figs. 13, 15; plate 3, figs. 18, 23; plate 4, fig. 26

Female.—Vertex with primary punctures of first-degree density between ocelli, and irregularly between eyes and ocellar triangle, elsewhere mostly of third-degree density, and not denser medially than on either side. Front shagreened on lower half; carina rather broadly conical, impunctate stripe narrow but well marked, groove well defined; primary punctures very large and of first-degree density

nearly everywhere except irregularly between ocelli and lower orbits, on lower half more densely grouped medially than near the eyes. Clypeus with its lateral margin strongly convex; extension with its apex impunctate except for minute punctures, the impunctate apex defined by coarse punctures which are not in a regular, transverse row, the longitudinal extension of the impunctate apex equal to two-fifths the distance from apex of clypeus to base of antennae. Antenna with its first joint slightly angulate apico-ventrally; third joint longer than its greatest width. Pronotum with its transverse carina completely and strongly developed; primary punctures of first-degree density over whole anterior dorsum, with no transverse discal band; secondary punctures almost lacking; median width of punctate area exceeding that of impunctate. Side of pronotum with a series of very irregular, short, interrupted grooves and punctures extending in a tapering series across the center; punctures distinct along the dorsal border, coalescing in a depressed patch just before the tegulae. Scutum with its notauli and its anterior medial groove continuous. Metanotum with a medio-apical callosity, punctures nearly as coarse as those of the scutellum. Legs with major calcarium of hind tibia tapering from base; hind basitarsus on the outside with a row of three pricklelike spines terminating before apex. Tegula with inner hind angle produced and upcurled, bearing dense yellow pile with some longer, suberect hairs. Wings very smoky, with first cubital mark not well defined. Propodeal areola hastate, twice as long as wide; outside carinae bordered with interrupted grooves; median carina usually irregularly broadened, with polished surface anteriorly, usually confined to upper three-fifths, with reticulate connections posteriorly; enclosed areas outside the reticulations smooth. Lower portion of side of propodeum with its anterior portion highly polished, posterior half with dense patch of conspicuous setigerous punctures. Posterior aspect of propodeum coarsely but shallowly punctate over all its surface; median carina strongly developed on lower half or less. First abdominal tergite dorsally with dimpled primary punctures, no preapical band, but a deep preapical groove, overlapped except at sides. First sternite with a median groove broken by transverse ridges; lateral grooves on posterior half or less; shallow punctures widely distributed over disk. Tergites 2, 3, and 4 with pronounced marginal incised lines but without dense patches of secondary punctures or any short, brown pile; no impunctate margins. Pygidium coarsely reticulo-punctate on basal three-fifths, usually without well-defined impunctate emargination of the punctate base, but with a low median carina extending the full length of the segment, apex anteriorly shagreened and strongly wrinkled. Length, 11.5 to 14.5 mm.

Male.—Vertex with primary punctures back of ocelli of first-degree density. Front shagreened on lower half; impunctate stripe and carina frequently present; primary punctures large, uniformly distributed over upper two-thirds, of first-degree density except for a limited preocellar area of second-degree density; secondary punctures more numerous than primary punctures on lower third, extending upward one-half distance to lowest ocellus laterally, not so high medially. Antennocular distance greater than width of antennal fossa. Clypeal extension with its width eight-ninths the clypeo-antennal distance; apex very shallowly emarginate, with a very narrow impunctate margin. Antenna with the third joint distinguished from the others by a reddish color. Pronotum with punctures large, deep, evenly spaced, mostly of first-degree density with a tendency to second degree; secondary punctures lacking. Side of pronotum frequently with an irregular, tapering groove or series of grooves, separated by diagonal rugae extending partially across the center. Mesepisternum with large, round, sharply outlined primary punctures, mostly of first-degree density; secondary punctures very well differentiated and on all parts of upper disk much more numerous than the primary punctures; posterior border elevated, though usually devoid of a true premarginal groove. Scutellum without impunctate apex as wide as the largest apical primary punctures. Metanotum with apical callosity; primary punctures nearly as large as those of the scutellum, and more than equaling the area of their interspaces. Tegula shagreened, with inner corner more than usually produced and upcurled, commonly with a posterior marginal impression ending abruptly at the outer hind corner. Wings with radial cell not equaling second cubital cell in apical extension. Propodeum with areola one and one-half times as long as wide, with sharply converging sides, areolar carinae becoming much higher posteriorly, median carina present on anterior half at most, frequently lacking, enclosed area flat and polished posteriorly; lower portion of sides faintly shagreened anteriorly, posterior portion minutely setulo-punctate; posterior aspect with a few large, vague punctures at the sides, its median carina present on lower half or less. First tergite with the large, dorsal primary punctures dimpled, no preapical band, but with a deep, preapical, overlapped groove. First sternite with its disk usually transversely wrinkled, the apical fossa crenulate; lateral grooves present on posterior half or less; a crenulate groove more or less clearly developed along the medial line; anteriorly without a well-defined keel. Tergites 3 to 5 with dense, short, erect, brown pile; punctures removed from the apex at most by about three times width of largest adjacent primary punctures; marginal grooved line developed over the dorsum on segments 2 to 5;

segment 6 with distinctly coarser punctures. Sternites with a narrow apical fringe of pile similar to that of the tergites. Genitalia in ventral aspect with the outer clasper elongate-lobate, gradually tapering toward its base; second genital segment with apical hook tapering abruptly to a sharp point and the inner hind margin broadly convex, but not angulate; distal portion of aedeagus with its apical lobes tapering to sharp, laterally-directed points, lateral processes somewhat broader than apical lobes; proximal portion of aedeagus with broad shoulders near the constriction. Length, 7 to 11 mm.

Distribution.—Chekiang, Kiangsu, and Fukien, China.

Type and allotype.—Cat. No. 41779, U.S.N.M. Type, female, Hangchow, China, September 19, 1924 (Chao), Exp. N4. Allotype, male, Hangchow, China, July, 1925 (Jaynes).

Paratypes.—Retained in the collection of the Japanese Beetle Laboratory: Four females and 2 males, Hangchow, China, July, 1925 (Jaynes). Deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences: Four females and 2 males to each, from the same lot as the above. Deposited with the United States National Museum: From Hangchow, China, 1 male, July 20, 1924; 10 males, August 31, 1924 (Jaynes); 1 male, August 31, 1924 (Illingworth); 11 males, September 4 to 22, 1924 (Illingworth); 1 male September 4, 1924, 1 male, September 16, 1924; 2 males, September 18, 1924; 28 females, September 19 to October 21, 1924 (Chao); 2 males, September 21, 1924; 1 male, October 2, 1924; 1 female, June 19, 1925 (Chao); 166 females and 81 males, July, 1925 (Jaynes); 3 females, July 6, 1925 (Chao); 21 females and 4 males, July 7, 1925 (Chao); 3 males, July 8, 1925 (Chao); 1 male, July 20, 1925 (Chao); 17 females, September 9 and 10, 1925 (Chao); 20 females, June 17 to 21, 1926 (Chao); and 5 males, June 19 and 20, 1926 (Chao). From Nanking, China, 1 male, September 30, 1924 (Jaynes). From Chinkiang, China, 1 female, July 12, 1924, Exp. A (Jaynes) Rohwer No. 12; 1 female and 1 male, July 26, 1924 (Illingworth) (Jaynes); 1 female, July 30, 1924; 1 female, August 13, 1924, Exp. 73 (Jaynes), Rohwer No. 12; 11 males, August 8 to 26, 1924 (Jaynes); 1 male, August 11, 1924; 1 female, July 5, 1925 (Wong); 5 females, 1925; 29 females (18 numbered) and 5 males. From Yangchow, China, 3 males, August 7 to 15, 1924 (Wong); 1 female, August 15, 1924 (Wong); 1 male, August 24, 1924; 2 males, August 24, 1924, Jaynes Nos. 92 and 94; from Penniu, China, 1 female, June 24, 1925 (Wong); 1 female, September 21, 1925 (Wong); 1 female, September 23, 1925 (Wong); 2 females, September 29, 1925 (Wong); 1 female, October 5, 1925

(Wong); 1 female, October 6, 1925 (Wong); 20 females, 1925 (Wong); 3 females, Riverton Exp. 207; 2 females, July 14 and 18, 1926 (Shien); 3 males, Riverton Exp. 207, August 9, 1926 (Jaynes); 1 male, Riverton Exp. 207, August 14, 1926 (Jaynes); 1 male, Riverton Exp. 224, August 19, 1926 (Jaynes); 8 males and 9 females, Riverton Exp. 205 insectary reared; 1 male, Riverton Exp. 207 insectary reared (Jaynes); 5 females reared from cocoons, 6 females, 1926, Jaynes No. 109 (Wong); 1 female, Riverton Exp. 307B, July 17, 1927, and 1 male, Riverton Exp. 307, July 1927. From Ningpo, China, 1 female, June 28, 1925, 1 female, June 29, 1925; 1 female, June 30, 1925; 1 male, June 30, 1925 (Chu); 51 females and 20 males, July 1, 1925 (Jaynes); 3 males, July 2, 1925 (Chu); 3 males, July 4, 1925 (Chu); 8 females, July 4, 1925; 13 females, July 5, 1925; 9 males, July 5, 1925 (Chu); 6 females, July 6, 1925; 5 males, July 6, 1925 (Chu); 2 males, July 7, 1925 (Chu); 1 female, July 8, 1925; 1 female, July 9, 1925; 25 females, July 12, 1925 (Jaynes); 2 females July 12, 1925; 1 female, July 13, 1925; 2 females, July 21, 1925 (Jaynes); 2 females, July 27, 1925 (Jaynes); 16 females, July 28, 1925 (Jaynes); 17 females, July 29, 1925 (Jaynes); 12 females, July 30, 1925 (Jaynes); 4 males, August 25, 1925 (Chu); 3 males, August 29, 1925 (Chu); 2 males, August 30, 1925 (Chu); 1 male, September 1, 1925 (Chu); 4 males, September 2, 1925 (Chu); 37 females, September 10, 1925 (Jaynes); 2 males, emerged August 27 to September 6, 1925, and 2 females, no date. From Kuliang, China, 1 female, July 4, 1925; 2 males and 1 female, August 16 to October 10, 1926 (Jen); 1 male, September 2, 1926; and 2 males, 1926 (Jen); 4 males, no labels.

Thirteen females differ from the type in having the tibiae or the femora or both castaneous to almost bright red. These specimens, which are included among the paratypes deposited in the United States National Museum, are as follows: One, Hangchow, China, September 19, 1924; 2, Penniu, China, 1926 (Wong); 4, insectary reared, Exp. 205; 1, Ningpo, China, July 1, 1925; 2, July 4, 1925; 2, September 10, 1925 (Jaynes); and 1, Chinkingiang, China, 1925.

Two of the male paratypes listed from Kuliang, China, differ from the type in having the clypeal extension truncate, thick, and punctate to the apex, and the mesepisternum with secondary punctures distinctly less numerous than the primaries medially along the vertical plane. In one, the third antennal joint is black. These may possibly be of another species, but, for lack of sufficient evidence, they are included here.

This species has been referred to in notes by the junior author under his species number 109.

9. TIPHIA TOTOPUNCTATA, new species

Female.—Vertex with primary punctures not denser medially than on either side, patches of first-degree density on both sides of ocellar triangle, elsewhere of second-degree density with many irregular impunctate areas. Front shagreened or polished, with a rather broad, short carina, a well-differentiated impunctate stripe, and a distinct groove; primary punctures coarse and deep, of first-degree density on lower half from eye to eye, between upper portion of eyes and ocelli, and on either side of vitta, with nearly impunctate spots between ocelli and the eye. Clypeus with its lateral margin slightly convex; extension with its apex impunctate for one-third distance to base of antennae; impunctate margin limited by a series of coarse punctures not arranged in a regular transverse row. Antenna with third joint distinctly longer than its greatest width. Pronotum with primary punctures large and uniformly of first-degree density; transverse discal band not differentiated; secondaries very few in number or absent; medial longitudinal extension of punctate area equal to or slightly greater than that of the impunctate area. Side of pronotum sometimes with a few well-separated punctures just back of the carina; a punctate depression in alar angle. Scutum with its notauli and its anterior medial groove continuous. Metanotum with minutely punctate apical callosity and dense, coarse punctures nearly equalling those of the scutellum. Legs with major calcarium of hind tibia curved but not bent, of equal thickness to middle, then gradually tapering to apex; hind basitarsus with row of three small, pricklelike bristles on outside, terminating far before apex. Tegula faintly shagreened; inner hind corner strongly produced laterally, and densely pilose. Wings smoky, with first cubital mark outlined below by a definite spur from the radius. Propodeal areola variable but usually constricted behind base and again at apex, three times as long as wide; lateral carinae with faint bordering grooves; median carina much interrupted. Lower portion of sides of propodeum faintly striate, the posterior half plainly setulose. Posterior aspect of propodeum smooth except for sparse, round punctures along sides and upper border; median carina usually lacking. First abdominal tergite with its preapical band consisting of a single row of coarse punctures which are sometimes in a slight depression, the band usually interrupted in the center. First sternite flat, with sides laterally expanded near petiole, an unusual amount of dense, appressed hair and sparse, round, widely scattered punctures anteriorly, and no lateral groove. Intermediate tergites with impunctate margin slightly wider at middle, where it is two or three times the width of largest apical primary punctures which are interrupted medially on tergites three and four. Pygidium very coarsely punctate on basal

two-thirds, with an irregular, impunctate, medial emargination of the punctate base elevated and almost carinate; apex strongly wrinkled and shagreened, with a yellowish margin. Length, 14 mm.

Male.—Not known.

Distribution.—Keikido, Chosen; Szechuen, China.

Type.—Cat. No. 41780, U.S.N.M. Type, female, Suigen, Chosen, August, 1926 (Gardner), Gardner No. 14.

Paratypes.—All females. In the National Museum: From Suigen, Chosen, 2, August, 1926 (Gardner), Gardner No. 14; 1, Gardner No. 14, No. 6. From Szechuen, China, 1, 1923 (Graham). Retained in the collection of the Japanese Beetle Laboratory: One, Suigen, Chosen, July 20, 1925 (Sato). In the collection of the Philadelphia Academy of Natural Sciences: One unlabeled specimen. In the British Museum: One, Suigen, Chosen, July 20, 1925 (Sato). To the collection of the Illinois Natural History Survey: One, Suigen, Chosen, August, 1926 (Gardner), Gardner No. 14.

The specimens collected by Gardner were used in breeding work in Chosen. Mixed with this lot, which bears the label Gardner No. 14, were two females of *fossata*.

10. *TIPHIA STERNODENTATA*, new species

Male.—Vertex with primary punctures of first-degree density between and behind ocelli and near upper orbit of eyes, sparse on either side of medial patch. Front vaguely shagreened; impunctate stripe and groove well developed; primary punctures large, of first-degree density upward from base of antennae to vertex laterally and to lowest ocellus along stripe, with a more sparsely punctate area diagonally below triangle; secondary punctures not apparent. Antennocular distance greater than width of antennal fossa. Clypeal extension with its width four-fifths the clypeoantennal distance; apex shallowly emarginate, with a narrow, impunctate border of uniform width and with a thick edge. Pronotum with punctures very large and shallow, uniformly of first-degree density, but with a tendency to second-degree density on apical half; almost devoid of secondary punctures. Side of pronotum sharply rugosopunctate behind carina, with a tapering series of diagonal rugae across center. Mesepisternum with primary punctures large and clearly outlined, mostly of first-degree density; secondary punctures well differentiated, more numerous than primaries on upper half, becoming sparse and finally disappearing medially; posterior border with a linear groove extending upward to spiracle. Scutellum minutely punctate to impunctate, apex much wider than diameter of lowest primary punctures. Metanotum with apical callosity, elsewhere densely coarse-punctate, with the primary punctures covering an area equal to

that of the interspaces and equalling the size of the largest primaries of the scutellum. Tegula plainly shagreened. Wings with first cubital mark clearly defined; radial cell equalling the second cubital cell. Propodeum with its areola one and one-fourth times longer than broad, sides convergent, rounded at apex where carinae are thickened, median carina expanded, and tapering to lowest fourth of areola, enclosed area flat and polished; lower sides with the anterior part finely striate and the posterior part minutely setulose; posterior aspect without medial carina. First tergite with preapical band not impressed, consisting of distinctly separate punctures about three rows wide. First sternite with disk densely covered with minute punctures, constricted half with shallow primary punctures and a median keel; apical sulca not well developed; lateral grooves absent. Second tergite with a single row of large apical punctures; tergites 3 to 5 with punctures becoming large toward apices, and with numerous minute but deep secondary punctures with sharply defined outlines scattered widely on posterior halves, apical primary punctures separated from apices of segments by distances much less than their diameters, and marked by even rows of conspicuous, yellowish hairs. Sternites two to five with apical rows of yellow hairs similar to those of dorsum; fifth sternite with its lateral denticle a strong, conspicuously elevated tooth, mediad of which there is a large orifice; fourth sternite with a vestigial orifice in a similar position. Length 14 mm.

Distribution.—Keikido, Chosen.

Holotype.—Cat. No. 41781, U.S.N.M. Male, Suigen, Chosen, May 10, 1923 (Clausen).

11. TIPHIA SINGULARIS, new species

Male.—Vertex with punctures back of and between ocelli and near inner margins of eyes of second-degree density. Front shagreened, with median carina well developed; primary punctures large, on anterior half from eye to eye their diameter very much exceeding width of narrow interspaces; area of punctures of first-degree density extending upward on sides to level of lowest ocellus; secondary punctures sparse on lower third. Antennocular distance greater than the width of antennal fossa. Clypeal extension with its apex shallowly emarginate, having a narrow, impunctate margin of uniform width; disk conspicuously shagreened; clypeoantennal distance equal to apical width of extension. Pronotum shagreened; primary punctures large and shallow, in a vague series of second-degree density, somewhat denser laterally; several secondary punctures in medio-anterior region. Sides of pronotum with a well defined, narrow median groove; disk finely striate above, and with large, round punctures at the alar angle. Mesepisternum faintly shagreened;

primary punctures large, shallow, but clearly outlined, of first-degree density, with tendency to grouping in rows; secondary punctures well differentiated and somewhat more numerous than the primaries, except in upper anterior region. Scutellum with its minutely punctate apex wider at places than diameter of the lowest primary punctures. Metanotum densely bipunctate, the primary punctures of third-degree density and much smaller than the largest on the scutellum. Wings with the usual hyaline lines scarcely visible; radial cell greatly exceeding second cubital cell in apical extension. Propodeum with areola one and one-fourth times as long as wide, with concave, converging sides; longitudinal carinae crenulate; median carina complete; side with its lower portion finely striate and without hairs; posterior aspect with median carina on lowest fourth. First tergite with preapical band not abruptly impressed, and consisting at center of a single row of punctures, expanding at sides, where it is also farther removed from apex. First sternite polished on disk, with numerous clearly outlined round punctures, and with a medial keel on anterior half, lateral grooves absent. Tergites 3 to 5 with fine, deep, clearly outlined punctures which become sparse apically; impunctate margin subobsolete, at most twice as wide as diameter of largest adjacent primary punctures; marginal linear groove usually complete across dorsum; lateral denticle of fifth sternite present as a longitudinal ridge over a large orifice with an upright, angular tooth in the floor of the orifice. Length, 8 to 12 millimeters.

Distribution.—Fukien and Chekiang, China.

Type.—Cat. No. 41782, U.S.N.M. Type, male Kuliang, China, 1926 (Jen).

Paratypes.—All males. Retained in the collection of the Japanese Beetle Laboratory: One, Hangchow, China, July, 1925 (Jaynes); 1, Kuliang, China, 1926 (Jen). Deposited with the U. S. National Museum: Twenty-four, Kuliang, China, 1925 (Jen). Deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences: One each of the same lot as the last.

The single specimen from Hangchow differs slightly from the type in being larger, in having the third antennal joint distinctly longer than its greatest width, and in having the marginal grooves complete across the dorsum in only the third tergite. The large orifice on the fifth sternite, with the projecting tooth on its floor, is distinctly different from any other species examined. It may possibly be the male of one of the species of which females only are discussed in this paper, possibly of *sternocarinata* collected at the same locality. The associations are vague, however, and can not be accepted until supported by further data.

12. *TIPHIA NOTOPOLITA*, new species

Female.—Vertex with primary punctures back of ocellar triangle of third-degree density, though noticeably denser than on the lateral vertex. Front shagreened on lower third, with a median groove; primary punctures in preocellar area of second-degree density just anterior to ocellar triangle, and of third-degree density on either side, with several interspaces as wide as an ocellus. Clypeus with its lateral margin slightly convex; impunctate apex of extension poorly defined anteriorly but distinguishable one-fourth the distance to base of antennae. Pronotum with its transverse carina complete; primary punctures uniform in size and evenly distributed over the anterior dorsum without a trace of a transverse discal band; medial longitudinal extension of punctate area equal to that of impunctate area. Side of pronotum with a definite groove across the center broken by unsculptured interspaces; anterior half usually with several widely scattered, deep, round punctures. Metanotum impunctate over much or all of its anterior surface, without a dense medial patch of minute punctures. Metasternum shaped like an arrowhead, with the outer wings well pointed and directed backward. Legs with the major calcarium of hind tibia tapering from its base; hind basitarsus on the outside with a group of 3 or 4 stout spines, one of which is apical. Tegula red, with a posterior marginal groove, and with only a vague impression on the lateral margin, which does not terminate posteriorly in an abrupt, inwardly directed hook. Wings moderately smoky; second intercubital vein straight and joining the radius at an abrupt angle. Propodeal areola two and one-fourth times as long as wide; sides slightly convergent, all the carinae bordered with deep, crenulate grooves; median carina complete. Lower portion of sides of propodeum polished, striate, with a limited area of very minute hairs. Posterior aspect of propodeum quite completely bipunctate; its median carina present as a faintly elevated, flat-topped ridge on the lower three-fourths or more. First tergite with its preapical band well defined, not in an impression, and consisting of well-separated punctures irregular in size and spacing, narrowing to a single row at the middle. First sternite coarsely coriaceous anteriorly, with lateral grooves on the posterior half. Intermediate tergites with the apical punctures more elongate than usual, and interspersed with minute, vestigial punctures which are present over the dorsum on tergites 3 to 5. Pygidium densely and evenly punctate on basal half, with an impunctate emargination; apex strikingly free from wrinkles and not shagreened. Length, 6 to 10 mm.

Male.—Vertex with punctures scarcely denser just back of ocelli than on either side, everywhere of third-degree density. Front with

primary punctures moderately large; lower portion with a medial extension of punctures of first-degree density; a broad preocellar region having numerous interspaces broader than an ocellus; secondary punctures more numerous than primaries on lower two-fifths, extending upward as far laterally as medially. Antennocular distance greater than width of antennal fossa. Clypeal extension with its apical width about equal to the clypeoantennal distance; apex shallowly emarginate and very narrowly impunctate, with a thick edge. Pronotum with primary punctures of moderate size, largely of third-degree density, a few secondary punctures in the median anterior region; sides with coarse, anastomosing striations on the anterior half, with a series of diagonal rugae tapering toward the alar angle. Mesepisternum with primary punctures large, round, deep, clearly outlined, and separated by distances greater than their diameters, the interspaces with well differentiated secondaries which, at the center, are not much more numerous than the primary punctures. Scutellum with impunctate apex medially wider than diameter of lowest primary punctures. Metanotum with punctures much smaller than the largest primary punctures of the scutellum, and of sparse third-degree density; sometimes nearly impunctate or with median patch of dense secondary punctures. Tegula with a well-defined impressed line, continuous about the lateral and posterior margins, sometimes interrupted at outer hind corner. Wings with the radial cell not extending apically quite as far as second cubital cell. Propodeum with the areola rather variable, about one and one-half times as long as wide, lateral carinae on outside bordered with vague grooves, median carina extending nearly to transverse carina, enclosed area with definite transverse ridges; side with its lower region finely striate, without hairs; posterior aspect not finely punctate but reticulo-rugose, particularly about the median carina which is evident on the lowest three-fourths. First tergite with preapical band not in a definite depression, composed of a single row of punctures which is often curved toward the apex medially. First sternite irregularly punctate on disk, with an apical crenulate fossa; lateral grooves on posterior half, frequently extending inward anteriorly from the border of sternite. Tergites 3 to 5 not shagreened; with posterior punctures separated from margins at most by four times the diameter of the largest adjacent primary punctures; marginal linear groove complete, or outlined by interrupted gouges over dorsum of last four segments; lateral denticle of fifth sternite present as a longitudinal ridge arched over an orifice. Length, 6 to 8 mm.

Distribution.—Chekiang, Kiangsu, and Fukien, China; Keikido, Chosen; Kanagawa, Japan.

Type and allotype.—Cat. No. 41783, U.S.M.N. Type, female, Ningpo, China, August 14, 1925 (Chao). Allotype, Ningpo, China, September 1, 1925 (Chu).

Paratypes.—In the collection of the U. S. National Museum: One female, Yokohama, Japan, September 15, 1921 (Clausen); 1 male and 1 female, Ningpo, China, September 6 to 10, 1925; 2 males, Kuliang, China, 1926 (Jen); 3 females, Penniu, China, Nos. 134, 316, and 428, respectively; 2 females, Penniu, China, 1926 (Wong), Jaynes No. 116; 2 males, Suigen, Chosen, Jap. Beetle Par. Exp. No. 318, and 2 males, August 8 and 21, 1922 (King). Retained in the collection of the Japanese Beetle Laboratory: One male, Ningpo, China, September 1, 1925 (Chu), 1 female, Ningpo, China, September 2, 1925, D9. Deposited in the collection of the Illinois Natural History Survey: One male, Penniu, China, Jap. Beetle Par. Exp. No. 205; 1 female, Ningpo, China, September 8, 1925, D18. In the British Museum: One male, Kuliang, China, 1926 (Jen); 1 female, Ningpo, China, August 25, 1925, D3. To the Philadelphia Academy of Natural Sciences: One male from Kuliang, China, 1926 (Jen); 1 female, Ningpo, China, September 10, 1925. Notes by the junior author on his No. 116 refer to this species and variety.

All the males listed above are probably referable to the variety *notopolita*, but in this sex the varieties could not be distinguished. The two from Suigen may be *intermedia*. The male genitalia are very similar to those of *rufomandibulata*. No other taxonomic characters were found by which the varieties, in the male sex, could be separated or distinguished from males of *rufomandibulata*.

TIPHIA NOTOPOLITA var. INTERMEDIA, new variety

Female.—The variety, in this sex, has many of the characters both of *rufomandibulata* and of *notopolita notopolita*, but resembles the latter more strongly, and is probably more accurately placed here as a variety than as a separate species or as a variety of *rufomandibulata*. It differs from the variety *notopolita* in the following characters: Sides of the pronotum with a central groove broken by unsculptured interspaces as in *notopolita* or continuous. Metanotum sparsely punctuate with small primary punctures and usually with a dense medial patch of minute punctures. Tegula with a posterior marginal groove and usually with a lateral marginal groove, both terminating in pronounced inward-directed hooks at the outer hind angle.

Type.—Cat. No. 41784, U.S.N.M. Female, Suigen, Chosen, September 25, 1924 (Sato), Clausen No. 1855.

To this variety are referred the following female paratypes. In the collection of the United States National Museum: Six, Suigen, Chosen, August 8, 21, 23, and 24, 1922 (King), Rohwer No. 7;

1, Suigen, Chosen, August, 1923 (Clausen); 7, Suigen, Chosen, August 23, 1923 (Sato), Gardner No. 4, Rohwer No. 7; 1, Suigen, Chosen, September 11, 1924 (Sato); 2, Suigen, Chosen, September 12, 1925 (Sato), Gardner No. 4; 1, Suigen, Chosen, September 20, 1925 (Gardner), Gardner No. 13 equals Clausen No. 1862; 1, August, 1926 (Gardner), Gardner No. 4 equals Clausen No. 1855; 4, Suigen, Chosen, Jap. Beetle Par. Exp. No. 300; 1, Penniu, China, Jap. Beetle Par. Exp. No. 308-C2, October 7, 1927; 1, Kuliang, China, July 19, 1924 (Jaynes); 1, Kuliang, China, August 16, 1926 (Jen); 1, Kuliang, China, 1926 (Jen); 1, Hangchow, China, June 8, 1926 (Chao); 1, Penniu, China, September 8, 1925, No. 108. Retained in the collection of the Japanese Beetle Laboratory and deposited in the collections of the Illinois Natural History Survey and the British Museum: One each from Suigen, Chosen, August, 1926 (Gardner), Gardner No. 4 equals Clausen No. 1855 (used in breeding work). In the Philadelphia Academy of Natural Sciences: One, Suigen, Chosen, September 29, 1925 (Sato) Gardner No. 4.

A number of specimens have vestigial lateral carinae on the constricted part of the first sternite, but these are not as high as in *sternocarinata*, and the interval between them and the medial carina is definitely coriaceous, and is not as deeply grooved. To this species and variety have been referred Clausen's material under his number 1855, which equals Gardner's number 4, and also a part of the material under Gardner's number 13, which included specimens of *popilliavora* as well.

The *notopolita* group, including the two varieties and the closely related *rufomandibulata* and *sternocarinata*, have furnished one of the most puzzling problems connected with any of the *Tiphia* considered in this paper. Individual females of the two varieties, which might easily be considered of two different species, can be picked out, but intergradients are numerous, and varietal rank seems the highest to which they should be assigned. Male genitalia of the two varieties and of *rufomandibulata* have been studied, and show no differences of importance.

13. TIPHIA RUFOMANDIBULATA Smith

Plate 3, fig. 20

Tiphia rufomandibulata SMITH, Trans. Ent. Soc., London 1873, p. 184.—PEREZ, Bull. Mus. Paris, 1905, p. 87.

The following notes were made from a study of specimens compared by Mr. Gahan with the type female from "Hiogo," Japan. Mr. Gahan, however, did not have specimens of either of the closely related varieties of *notopolita* with him at the time of comparison.

Since these varieties occur in Chosen, which is much nearer the habitat of the type of *rufomandibulata* than is the locality of the Chinese specimens seen by Mr. Gahan, it is possible that the species we have named *notopolita* may be taxonomically nearer the type than the one selected.

Female.—Vertex with primary punctures of first-degree density in very limited patches between ocelli and near upper part of eyes, elsewhere largely of second-degree density with irregular impunctate spaces. Front shagreened on lower half, with a well-developed median groove which extends half way to ocellus, and with an impunctate stripe; primary punctures more densely grouped on anterior half, where they are evenly distributed between the eyes, mostly of second-degree density, with vaguely defined, trident-shaped impunctate area below ocelli. Clypeus with its lateral margin distinctly convex; apex impunctate except for numerous, barely visible punctures, the impunctate apex poorly defined above by coarse punctures which are irregular in size and arrangement. Pronotum with its transverse carina complete; primary punctures of uniform size and evenly distributed over the anterior portion of the dorsal aspect; no transverse discal band; medial longitudinal extension of punctate area slightly greater than that of impunctate area. Side of pronotum with definite groove across center, along the bottom of which are numerous small rugulae, especially from center to alar angle; no group of well-developed primary punctures on anterior half. Metanotum finely, uniformly, and sparsely punctate, punctures much smaller than those of the scutellum; dense, minute punctures lacking. Legs with major calcarium of hind tibia tapering uniformly; hind basitarsus on outside with a group of four straight, stout, lanceolate spines, one of which is apical. Tegula black, polished, with very shallow marginal impression laterally and another impression on posterior margin, both terminating in inward-directed hooks at the lateral, posterior corner; outer impression sometimes lacking. Wings densely smoky; second intercubitus sinuous, joining radius in a rounded angle, usually without spur; first cubital mark barely perceptible. Propodeal areola with its sides converging, scarcely two times as long as wide; medial carina complete and of the same size throughout, somewhat flattened and polished on top and bordered by numerous short transverse ridges. Lower portion of sides of propodeum rugulose over all the surface, but more conspicuously so toward upper rugose portion. Posterior aspect of propodeum conspicuously bipunctate, particularly on the lateral extension; median carina present as a strong, rounded, tapering rib on the lower three-fourths, bordered by irregular transverse rugosities. First tergite with a rather large median patch of dense, minute punctures;

preapical band well defined, not in depression, but consisting of irregularly distributed, well separated punctures narrowed to a single row at the center. First sternite with lateral grooves on posterior half; no other sculpturing. Tergites 4 and 5 with a more or less interrupted row of minute non-setigerous punctures just before the apex; apical setigerous punctures scarcely farther removed from the apex medially than at the sides. Pygidium densely and evenly punctate on basal three-fifths, with an elongate, impunctate, shagreened emargination; apex faintly wrinkled and shagreened. Genitalia with outer clasper abruptly constricted near middle, outer edge deeply emarginate; second genital segment with a small, slender apical hook, inner margin narrowly convex near the hook; distal portion of aedeagus with lateral processes lacking, apical lobes broadly inflated and somewhat polygonal in outline; proximal portion of aedeagus slender; constriction separating the two portions not well marked. Length, 10 to 11 mm.

Male.—We have been unable to separate the male from the male of *notopolita*.

Distribution.—Hyogo, Japan; Chekiang, China.

These notes were based on the following material. In the collection of the Japanese Beetle Laboratory: One female, Hangchow, China, October 3, 1924 (Chao); 3 males and 18 females, Hangchow, China, July, 1925 (Jaynes); 6 males and 5 females with dates from July 10 to July 24, 1926 (Chao); 2 questionable males, 1 from Foochow, China, July 19, 1924 (Jaynes), and 1 from Ningpo, China, emerged from cocoon August 27, 1925. In the collection of the U. S. National Museum: One female, Hangchow, China, July 7, 1925 (Chao); 3 females, Hangchow, China, July, 1925 (Jaynes). Deposited in the collections of the Illinois Natural History Survey, the British Museum, and the Philadelphia Academy of Natural Sciences: One female to each from Hangchow, China, July, 1925 (Jaynes).

One female collected at Hangchow, China, October 3, 1924, resembles *notopolita* in having the second intercubitus straight and the metathorax impunctate anteriorly, but is typical in other characters.

14. *TIPHIA STERNOCARINATA*, new species

Female.—Closely related to *notopolita notopolita*, from which it differs in the following particulars. Dorsum of pronotum shagreened on the anterior third. Side of pronotum with the central groove deep and uniformly tapering to alar angle without interrupting rugulae; no group of punctures on the anterior half. Mesepisternum conspicuously shagreened. Metanotum finely bipunctate apically, with tendency to be impunctate anteriorly. Metasternum with its outer posterior angle rather more sharply produced, and inclined posteriorly.

Tegula largely reddish, without true marginal grooves, at most with an upfolded posterior margin. First sternite not coriaceous anteriorly, with its basal medial process elevated into a sharp ridge on either side of the short medial keel. Length 9 to 12 mm.

Male.—Not known.

Distribution.—Fukien, China.

Type.—Cat. No. 41785, U.S.N.M. Female, Kuliang, China, August 16 to October 10, 1926 (Jen).

Paratypes.—In the United States National Museum: Three females from Kuliang, China, August 16 to October 10, 1926 (Jen). Deposited in the collections of the British Museum, the Japanese Beetle Laboratory, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences: One female to each from Kuliang, China, August 16 to October 10, 1926 (Jen).

The variety *notopolita intermedia* often has carinae on each side of the antero-medial keel of the first sternite, but it is also coriaceous in this region while in *sternocarinata* the corresponding area is smooth.

15. TIPHIA BREVICARINATA, new species

Female.—Vertex with patch of punctures of first-degree density back of ocellar triangle, scarcely any between ocelli, and nearly impunctate spots beside and diagonally behind posterior ocelli, elsewhere of second-degree or third-degree density. Front with primary punctures most densely grouped on anterior half, where they are not more dense medially than elsewhere, and are of first-degree density, thinning out above to second-degree and third-degree density without definite impunctate spots. Clypeus with its lateral margin strongly convex; extension impunctate except for numerous barely visible minute punctures, the impunctate area poorly defined above by coarse punctures which are irregular in size and arrangement, its longitudinal extension about one-third as great as the clypeoantennal distance. Antenna with its third joint slightly longer than greatest width; flagellum slightly fulvous beneath. Pronotum faintly striate anteriorly, with its transverse carina complete, but weakly developed; primary punctures of uniform size, and evenly distributed over the anterior dorsum; no transverse discal band; medial longitudinal extension of punctate area slightly exceeding that of impunctate area; side of pronotum with a definite groove across the center. Metanotum with punctures much smaller than those of scutellum; lateral angle with dense patches of minute secondaries. Legs with major calcarium of hind tibia widest near middle; hind basitarsus on outside with irregular group of several specialized lanceolate spines, one at apex. Tegula with inner hind angle considerably produced. Wings smoky. Propodeal areola convergent, with its

sides concave and its apex truncate; the carinae strong, and bordered by crenulate grooves; median carina somewhat expanded anteriorly, complete to apex of inclosure. A pair of unusual, short, transverse ridges on dorso-propodeum just before the transverse carina. Lower portion of sides of the propodeum shagreened to striate. Posterior aspect of propodeum lacking usual coriaceous sculpturing of the sides, but with scattered, shallow punctures medially, median carina present on lowest three-fourths, with short lateral ridges. First tergite with apical band fairly well defined, expanded laterally, not depressed, the punctures everywhere distinctly separated. First sternite with lateral grooves complete to anterior apex and bordered by shallow reticulate punctures. Tergites 3 to 5 with impunctate apices scarcely one-tenth the total width of punctate portion. Pygidium finely and uniformly punctate on basal three-fifths; impunctate apex wrinkled and faintly shagreened toward punctures. Length, 13.5 mm.

Distribution.—Kiangsu, China.

Holotype.—Cat. No. 41786, U.S.N.M. Female, Penniu, China (Wong) No. 269.

16. *TIPHIA LYRATA* Magretti

Plate 2, fig. 12

Tiphia lyrata MAGRETTI, Ann. Mus. Civ. Genova, vol. 32, p. 252, 1892.

Female.—Vertex with a few punctures of second-degree density just behind the ocellar triangle and narrowly along upper eye orbits, punctures of sparse third degree elsewhere. Front with vestigial impunctate stripe; primary punctures not more dense above base of antennae than on either side, largely of first-degree density on lowest third, particularly along the eyes, of second-degree to third-degree density around ocellar triangle below, without symmetrical impunctate areas. Antenna sometimes fulvous beneath. Clypeal extension with longitudinal extension of its impunctate margin about one-third as great as clypeoantennal distance. Pronotum with transverse carina usually complete; primary punctures unusually uniform in size and distribution, without trace of a transverse discal band, and only slightly denser medially than on either side, density from first to third degrees; secondary punctures sparse on anterior half of punctate area; impunctate apex with a narrow antero-medial prolongation which makes the punctate portion narrower medially than the impunctate. Side of pronotum with a shallow groove extending about half way across the center, otherwise much smoother than usual below the groove. Metanotum nearly impunctate, its few punctures much smaller than the primary punctures of the scutellum. Legs with major calcarium of hind tibia not abruptly bent or wider near middle than at base; hind basitarsus on outside with three

rather inconspicuous spines in a row, one of which is apical. Tegula reddish, semi-transparent. Wings slightly smoky. Propodeal areola vase-shaped in outline, nearly twice as long as wide; carinae bordered by interrupted grooves; median carina extending to lowest fifth or more; on each side of median carina, a much shorter, sinuous carina; enclosed area shagreened anteriorly, reticulated behind. Lower portion of side of propodeum weakly rugulose, without apparent hairs. Posterior aspect of propodeum without medial carina. First tergite with a preapical band of punctures rather irregular as to size and arrangement, but well separated, except laterally, where the band is slightly expanded and the punctures coalesced. First sternite polished, with very little hair, and with lateral grooves on posterior half or less. Tergites 2 to 4 with impunctate apices widest at middle, where they are at least four times as wide as the adjacent primary punctures; tergite 4 with a vestigial row of minute punctures extending dorsally over the center of the otherwise impunctate apex. Pygidium densely reticulo-punctate on basal half; apical section plainly wrinkled longitudinally; sting stylet and palps extruding from tip of abdomen for distance equal to half width of pygidium. Length, 8 to 9 mm.

Distribution.—Burma; Fukien and Kiangsu, China.

These descriptive notes are based upon 5 females. Retained in the collection of the Japanese Beetle Laboratory: One, Kuliang, China, August 16, 1926; 1, Yangchow, China, August 18, 1924 (Wong). In the United States National Museum: One, Kuliang, China, August 16, 1926. Deposited in the collections of the British Museum and the Illinois Natural History Survey: One to each from the same lot as the last.

One female from Yangchow, August 18, 1924 (Wong), differs slightly from the Kuliang specimens in having the groove across the middle of the pronotum reduced to a vague line of short, shallow gouges on a smooth field.

This is an unusual species in that it has five longitudinal areolar carinae. All the specimens mentioned above agree with the original description and with determined specimens examined in the British Museum by Mr. Gahan. A specimen compared with the type at the Museo Civico di Storia Naturale, Genoa, Italy, by Prof. L. Masi was found to agree in all particulars except that the abdominal punctures were more evident, especially on the last tergite.

17. TIPHIA CAPILLATA, new species

Female.—Vertex with primary punctures not denser medially than elsewhere, of second-degree and third-degree density excepting a narrow line of first-degree density near upper eye-margin. Front

plainly shagreened; a medial groove usually well developed; primary punctures rather regularly distributed, increasing in density toward region just above antennae where they are of first-degree density; hairs directed conspicuously outward. Clypeus with the lateral margin decidedly convex; impunctate apex frequently red, limited by irregularly grouped punctures which approach the apex medially, causing the impunctate area to be much broader at the sides than at the center. Mandibles usually without median groove. Antenna with the first joint angulate apico-ventrally; third joint slightly longer than the greatest width; flagellum slightly fulvous beneath. Pronotum with its transverse carina usually complete but weakly developed; primary punctures densely distributed, with a tendency to concentrate medially and in a discal band; secondary punctures widely distributed and occurring densely just back of the carina on the sides of dorsum; punctate area conspicuously shagreened, its median longitudinal extension slightly narrower than that of the impunctate portion. Side of pronotum unusually free from sculpturing, with the usual rugulae at the ventral corner sometimes enlarged to shallow grooves at their upper extension; several distinct punctures along the posterior dorsal border; the upper disk highly polished. Scutum with its notauli and its antero-medial groove usually continuous; conspicuously shagreened. Metanotum densely bipunctate with a polished callosity. Legs with tibiae and tarsi of first two pair bright red; major calcarium of hind tibia uniformly tapering; hind basitarsus with two pricklelike spines on outside near middle, none of the same kind at the apex. Tegulae thin, semitransparent, reddish, polished. Wings nearly hyaline; hyaline lines not present. Propodeal areola almost rectangular in outline, twice as long as wide, carinae uniform and narrow, without conspicuous bordering grooves; median carina not quite complete. Lower portion of sides of propodeum wavy-rugose, not well differentiated from the rugose upper half where the ridges are weak and disappear posteriorly. Posterior aspect of propodeum with clearly defined punctures, median carina not raised but defined by parallel grooves extending beyond lower half. First tergite usually with a small patch of minute punctures on the anterior slope; preapical band vaguely defined by very fine, widely separated punctures in a broad, shallow depression. First sternite polished and without sculpturing, lateral grooves lacking. Intermediate abdominal tergites with large apical setigerous punctures extending medially into subdiscal region. Pygidium sparsely punctate on upper three-fifths, area of interspaces greatly exceeding that of punctures, no marked impunctate emargination; apex faintly wrinkled below lowest punctures; all conspicuously shagreened. Length, 8.5-9 mm.

Male.—Vertex with primary punctures everywhere of third-degree density, scarcely more abundant back of ocelli than on either side of them. Front shagreened; primary punctures very small; punctures of the lower front scarcely of first-degree density; preocellar area vague, with primary punctures uniformly of third-degree density; secondary punctures not apparent; lower part of front masked by dense, appressed white hair directed laterally; a conspicuous medial impression on lower half. Antennocular distance greater than width of antennal fossa. Clypeal extension with apex shallowly emarginate, and with an impunctate border masked by dense appressed hairs; clypeoantennal distance one and one-fourth times width of extension. Antenna with all segments of flagellum broadly suffused with red below. Pronotum more or less masked by appressed white hair directed laterally on the disk; with primary punctures small and poorly differentiated from the secondary punctures which are numerous, particularly in latero-discal patches. Side of pronotum mostly polished and striate. Mesepisternum with primary punctures small, very shallow, and poorly outlined, largely of third-degree density; secondary punctures poorly differentiated, slightly more numerous than the primary punctures on upper half; with linear groove extending along the posterior border to subalar callosity. Scutellum with impunctate apical area not as wide as the largest primary punctures. Metanotum conical, with impunctate apical callosity, surrounding which are primary punctures of first-degree density nearly the same size as the largest primary punctures of the scutellum. Tibiae and tarsi reddish. Tegulae reddish yellow, very thin, and nearly transparent. Wings hyaline; radial cell much exceeding second cubital cell in apical extension. Propodeum with areola rectangular in outline, slightly longer than wide; longitudinal carinae flattened, without grooves on outside; enclosed area polished; laterodorsum finely punctate; lower portion of sides finely striate, not clearly defined from the upper rugose region; posterior aspect with fine setulose punctures. First tergite with preapical band of shallow, vaguely outlined punctures widely scattered in a shallow depression. First sternite conspicuously convex anteriorly, without trace of median keel, with disk polished and sparsely fine-punctate; apical groove obsolete, and lateral grooves not present. Intermediate tergites with the primary punctures small, shallow, and sparse; with impunctate apices as wide as five times the diameter of nearest adjacent primary punctures. Length, 6 to 7 mm.

Distribution.—Assam, India.

Type and allotype.—Cat. No. 41787, U.S.N.M. Type, female, Shillong, India, Jap. Beetle Par. Exp. No. 202. Allotype, male, Shillong, India, Jap. Beetle Par. Exp. No. 202.

Paratypes.—In the National Museum: Two females and 10 males, Jap. Beetle Par. Exp. No. 202; 1 male, unlabelled. Retained in the collection of the Japanese Beetle Laboratory: One female and 1 male, Jap. Beetle Par. Exp. No. 202. In the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences: One each of the same lot as those retained at the Japanese Beetle Laboratory.

From cocoons collected in India, which were mostly of *pullivora*, *capillata*, and *levipunctata*, adults were reared in limited numbers at the Japanese Beetle Laboratory.

Mr. Gahan reports that *fuscinervis* Cameron is represented in the British Museum by a female and 2 males from the Kanga Valley. The original description is from a female collected at "Mussori" by Rothney. *Tiphia capillata*, according to Gahan, is the same species as the specimens in the British Museum determined as *fuscinervis*, but since the type of *fuscinervis* was not examined, the authors consider it best to call the specimens listed above a new species.

18. *TIPHIA LEVIPUNCTATA*, new species

Female.—Vertex with primary punctures scarcely denser medially than on either side, of third-degree density except narrow line of first degree near eye. Front faintly shagreened, with a linear medial impression on lower half; primary punctures very small and everywhere of third-degree density, though much more sparse on upper half, where there are a number of interspaces two to three times as broad as an ocellus. Clypeal extension with the length of its impunctate margin uniform from side to side, and more than half as great as clypeoantennal distance. Mandibles, apex of first antennal joint, and under side of flagellum fulvous. Pronotum with its transverse carina complete, though weak; primary punctures sparse and poorly outlined, nearly as dense on lateral disks as medially, transverse discal band weakly developed; secondary punctures not apparent; punctate portion with its longitudinal extension medially as great as the impunctate apex. Side of pronotum with a vague central groove in the midst of finer striations. Metanotum with impunctate spots on disk and dense minute punctures about the margins, none of which are nearly as large as the primaries of the scutellum. Legs with the trochanters, femora, and tibiae of the last two pairs, as well as the inner surfaces and tarsi of the first and the tarsi of the second bright red; major calcarium of the hind tibia widest just before the middle; hind basitarsus with three lanceolate spines on the outside, one of which is apical. Tegula red, thin, semitransparent. Wing hyaline; terminal stump of cubital longer than preceding abscissa, sinuous on a course perpendicular to costa; stigma much less than

twice as long as wide, with radius joining it near its apex. Propodeal areola slightly convergent, with concave sides, two and one-half times as long as wide, carinae of uniform height throughout, bordered by irregular grooves, median carina on upper five-sixths. Upper portion of sides of propodeum feebly rugose and not clearly differentiated from the lower portion, which is faintly striate, with microscopic hairs. Posterior aspect of propodeum feebly sculptured, with faint carina on lower half or less. First tergite with its preapical band in a faint depression and consisting of a single row of small punctures separated by interspaces exceeding their diameters. First sternite as broad as long, coriaceous at constriction but becoming minutely setulose posteriorly along the sides; lateral grooves on posterior half or less. Tergites with punctures rather small; length of impunctate apices of intermediate tergites more than half length of punctate portion medially. Pygidium rather finely punctate on upper half; apex scarcely wrinkled. Length, 6 mm.

Male.—Not known.

Distribution.—Assam, India.

Type.—Cat. No. 41788, U.S.N.M. Female, Shillong, India, Insectary reared, 302-0.

Paratype.—One female in the collection of the Japanese Beetle Laboratory, from the same lot as the type.

This species was obtained from cocoons collected in India and shipped to the New Jersey station. Emergence occurred in the fall of 1927.

19. TIPHIA POPILLIAVORA Rohwer

Plate 1, fig. 3; plate 3, figs. 21, 22; plate 4, figs. 27, 28

Tiphia popillivora ROHWER, Proc. Ent. Soc. Wash., vol. 26, p. 89, 1924.—CLAUSEN, KING, and TERANISHI, U. S. Dept. Agr. Bull. 1429, pp. 33-39, fig. 24, 1927.—KING and HALLOCK, Journ. Econ. Ent., vol. 18, p. 356, 1925.—KING, ALLEN, and HALLOCK, Journ. Econ. Ent., vol. 20, p. 368 and p. 373, 1927.

The following notes are supplementary to the original description.

Female.—Vertex with several irregular patches of primary punctures of first-degree density, the one immediately back of the ocellar triangle much denser than the area on either side of it; minute punctures in irregular linear series on the median dorsal line extending from the occipital region towards the ocellar triangle. Mandibles with an uninterrupted median groove. Pronotum not shagreened, with a fairly well differentiated transverse discal band; punctures on lateral disks sparse, with distinct primaries always present. Scutum with its notauli and its antero-medial groove not continuous. Metanotum sparsely bipunctate, with median longitudinal impression; largest punctures scarcely half the size of those of the scutellum. Leg

of the usual type of those with grooved hind basitarsus, the basitarsus having also a group of stout spines on the outside and one of the same type at the apex; major calcarium of the hind tibia widest at the bend near the middle. Tergites without preapical groove or interrupted minute punctures, the impunctate margin about four times width of largest adjacent primary punctures at middle of dorsum.

Male.—Vertex with numerous minute punctures on the interspaces back of the ocellar triangle, densest along the median line; front with conspicuous dense secondary punctures extending upward on the interspaces to the level of lowest ocellus. Antennocular distance about equalling the diameter of an antennal fossa. Clypeoantennal distance one and one-fourth times width of clypeal extension at its apex, margin of latter broadly impunctate and upcurled. Flagellum of antenna black; third antennal joint not longer than broad. Mesepisternum with its secondary punctures well differentiated from the primaries and more numerous everywhere, the interspaces densely studded with them. Scutum with impunctate apex wider than the diameter of the largest of the lower primary punctures. Metanotum usually with a vague medial impression; densely beset with primary punctures nearly as large as the largest of the scutellum. Preapical band of first tergite nearly uniform in width, its anterior margin often abruptly impressed at the sides, and its punctures of uniform size, moderately well separated, in a series about three punctures wide. First sternite with polished disk, lateral grooves on posterior half, coriaceous to shallowly punctate anteriorly, with short anteromedial keel. Tergites shagreened, without grooves or vestigial punctures over the apical dorsal margins, the impunctate apices medially only about three times as long as width of largest adjacent primaries. Sixth sternite with an appressed denticle, its elevated edge rather long, and more nearly parallel to the apex of the sternite than to the longitudinal plane. The impunctate, polished medial stripe of the hypopigium narrow and linear.

Distribution.—Iwate, Kanagawa, Japan; Keikido, Chosen; Kiangsu and Chekiang, China; New Jersey, United States of America.

In addition to the type material at the U. S. National Museum, the writers have examined the following material in the collections of the U. S. National Museum and the Japanese Beetle Laboratory: Recoveries made at Riverton, N. J., 11 males, August 12, 1926 (Allen); 18 males with dates from August 9 to 16, 1927; 38 females, 1927. From Morioka, Japan, 1 female, August 20, 1920 (Clausen). From Kowai, Japan, 1 female, September 1, 1921 (Clausen); 48 males and 4 females, reared at Riverton in 1922, Exp. 4; 16 males and 3 females, reared at Riverton in 1923, Exp. 76; 6 males and 75 females, August, 1926; 2 females, no date. From Yokohama, Japan 1 male

and 1 female, September 15, 1921 (Clausen); 1 female, October 20, 1921 (King). From Suigen, Chosen, 1 female, August 24, 1922 (King); 43 females, August, 1923 (Clausen); 3 females, September, 1924 (Gardner), Clausen No. 1856; 3 females, September 11, 1924 (Sato), Clausen No. 1856, parasite on *Popilla atrocoerulea*; 3 females, September 15, 1924 (Sato) Clausen No. 1862, parasite on *P. castanoptera*; 3 females, September, 1925 (Gardner), Clausen No. 1856; (Sato), Clausen No. 1856, parasite on *Popillia atrocoerulea*; 3 females, September, 1925, Gardner No. 13 equals Clausen No. 1862; 1 male and 3 females, insectary reared, Riverton Exp. 220; 4 males, insectary reared, Riverton Exp. 320; 1 male and 1 female, insectary reared, Riverton Exp. 321; 1 female, insectary reared, Riverton Exp. 318; 2 females, September 12, 1925 (Sato), Gardner No. 5; 2 females, September 26 and 30 (Sato), Gardner No. 13; 2 males, Gardner No. 5. From Penniu, China, 127, dates from September 24 to October 9, 1925, "laid on P. T. grubs" (*Popillia formosana* Arr.); 1 female, September 30, 1925 (Wong), "laid on P. T. grubs"; 29 females, between October 8 and 16, 1925 (Wong); 124 females, 1926, Jaynes No. 115 (Wong); 9 males and 20 females, insectary reared, Riverton Exp. 205; 2 males and 3 females, insectary reared, Riverton Exp. 305; 44 females, numbered specimens. From Hangchow, China, 13 females, between September 4 and October 30, 1924, lettered, respectively, P5, T5, V8, Z6, D6, W7, X7, S8, L8, U7, N8, K8, and V7; 1 female, September 19, 1924. Specimens from the above list have been deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences.

This group seems to be one of the dominant complexes in the *Tiphia* of the Oriental region. After studying a much larger series than Rohwer had at the time his description was made, the writers accept his finding on the species, with minor exceptions. His seven paratype females from Suigen, Chosen, which were collected August 20, 1923, by C. P. Clausen and recorded, under Clausen No. 3, as parasitic on the grubs of *Phyllophaga* species, are unquestionably another species which we have described as *phyllophagae*. Two additional paratype females collected by J. L. King at Suigen, Chosen, August 26, 1922, also belong under *phyllophagae*. Certain biological differences exist between the material reared in Japan and that reared in China or Chosen, but a prolonged study of our material has failed to reveal any constant anatomical characters of sufficient importance to elevate them to the rank of separate species. In the Japanese females examined, the pronotal ridge is almost always complete across the dorsum, there is present in a small number a

very weakly developed carina on the posterior aspect of the propodeum, the sides of the pronotum have merely a diminishing series of parallel rugulae extending across the center to the alar angle, and the length varies from 8.5 to 10 mm. In the females from Chosen the pronotal carina is somewhat more strongly developed, the carina on the posterior aspect of the propodeum is developed on the lower fourth to half in nearly all specimens, there is often a tendency towards a definite groove on the center of the side of the pronotum not like the regular diminishing rugulae in the Japanese race, and the length is usually about 12 mm. The Chinese females are intermediate. Most of them have the pronotal carina more weakly developed across the dorsum, the carina on the dorsal aspect of the propodeum slightly developed, the side of the pronotum more nearly approaching that of the Japanese race, though not so deeply rugulose. Fewer differences have been noted in the males. The genitalia of the males of the Japanese, Chosen, and Chinese races of *popilliavora* resemble one another and the genitalia of the males of *phyllophagae*, and present to the writers no differences of diagnostic importance.

20. *TIPHIA PHYLLOPHAGAE*, new species

Plate 3, fig. 17

Female.—Vertex usually without minute punctures dorsally, rarely with a few along the medial line; with primary punctures denser just back of ocelli than on either side, mostly of second-degree density, with irregular impunctate areas laterad to outside ocelli. Front with primary punctures not denser on anterior half than elsewhere, everywhere of second-degree density, without pronounced impunctate areas. Clypeus with its lateral margin straight; impunctate margin of extension defined by an irregular row of punctures, its length two-fifths the distance from apex of clypeus to base of antennae. Mandibles with a rather shallow but continuous median groove. Pronotum with its transverse carina usually complete, though weakly developed; punctures of variable size, secondaries not well differentiated from primaries; primary punctures densely grouped in a very distinct though irregular transverse discal band and in a small medial patch, on either side of which they become very small and sparse; lateral extensions of discal band with 3 or 4 punctures much larger than the others; punctures on lateral disks and on angle of discal band just anterior to tegula largely true secondaries. Sides of pronotum with a very definite groove across the center merging with less conspicuous anastomosing grooves anteriorly; conspicuously striate on ventral corner, with a few punctures along the dorsal border. Metanotum usually with a shallow median impression;

posteriorly densely bipunctate, the larger punctures not nearly equaling the largest punctures of the scutellum in size. Legs with major calcarium of hind tibia having a distinct bend near the middle where calcarium is slightly wider than at base; hind basitarsus with a groove and with a group of 3 or 4 lanceolate spines on the outside, one of which is apical. Tegula with inner hind corner not produced in a broad angle, only sparsely hairy, with no hairs extending far above tegula when viewed from opposite side. Wings smoky; first cubital mark vaguely defined. Propodeal areola with sides nearly parallel, two to two and one-half times as long as wide; its carinae narrow, bordered by well developed grooves; median carina complete. Lower portion of side of propodeum mostly shagreened, with a patch of very fine hairs posteriorly. Propodeal slope without well developed punctures; median carina usually confined to lowest two-thirds. First abdominal tergite with its preapical band varying from one puncture wide at center to several at the sides, not in a depression, most of the punctures separated. First sternite with lateral groove complete to near anterior apex, with shallow punctures anteriorly. Tergites with punctures not farther from apex medially than laterally; impunctate border three to four times the width of hindmost primary punctures. Pygidium densely reticulo-punctate on basal three-fifths; impunctate apex with numerous wrinkles, broadly shagreened on wrinkled portion. Length, 9 to 14 mm.

Male.—Vertex with dense secondary punctures invading the dorsum from behind on a front wider than ocellar triangle; primary punctures back of ocellar triangle of first-degree density. Front faintly shagreened, with primary punctures on lower portion sparser and more limited in distribution medially than along eyes; preocellar area with numerous interspaces nearly as broad as ocellus; secondary punctures forming a dense patch on lower two-fifths, extending upward slightly more medially than near the eye. Antennocular distance equal or slightly greater than width of antennal fossa. Clypeal extension with its apical width from four-sevenths to two-thirds the clypeoantennal distance; apex shallowly emarginate; margin narrowly but distinctly polished, impunctate, and slightly up-curved. Pronotal punctures with clearly defined margins, somewhat denser medially than on humeri, mostly of third-degree density; secondary punctures widely and sparsely distributed. Side of pronotum finely striate, with a strong central groove which is usually uninterrupted. Mesepisternum with primary punctures small, deep, and clearly outlined, everywhere of third-degree density; secondary punctures much more numerous than primaries, densely studding the interspaces. Scutellum with impunctate apex not as

wide as diameter of the apical primary punctures. Metanotum densely punctate, with primary punctures nearly as large as those of the scutellum. Tegula with only a vague, shallow impression on the anterior lateral margin. Wings with radial cell equalling second cubital cell in apical extension. Propodeum with its areola from one and one-fourth to one and one-half times as long as wide, its sides usually slightly convergent and concave, the median carina wider than the lateral carinae, flattened on top, and usually ending abruptly just before apex of areola, enclosed area irregularly and transversely rugose and granulate; lower portion of sides densely shagreened; posterior aspect granulate, the minute punctures poorly outlined, the median carina developed on lower half or more. First tergite with preapical band wide, its anterior margin somewhat abruptly impressed, the punctures well differentiated only on the posterior border. First sternite with apical fossa obsolete; disk polished, impunctate; lateral grooves on posterior half, curved upward anteriorly; a sharp median keel on anterior half. Tergites 3 to 5 usually shagreened; punctures deep, with clearly outlined margins; impunctate margins absent, or at most only as wide as the diameters of the largest adjacent primary punctures; denticle on fifth sternite appressed, its elevated margin moderately long, crescent-shaped, and nearly parallel to apex of sternite, frequently with smaller denticles similarly located on the fourth and third sternites. Genitalia, in ventral aspect, with the outer clasper abruptly constricted near the middle, the apical portion very broad and vaguely quadrangular; second genital segment with its apical hook roundly and bluntly pointed; the inner hind margin with a pronounced rounded angle; distal portion of aedeagus with its apical lobes larger than the lateral processes; the proximal portion of the aedeagus broader apically than at its base.

Distribution.—Keikido, Chosen; Iwate, Japan; Kiangsu, Chekiang, and Fukien, China.

Type and allotype.—Cat. No. 41789, U.S.N.M. Type female and allotype, male, Suigen, Chosen, August, 1923 (Clausen).

Paratypes.—Retained in the collection of the Japanese Beetle Laboratory: Four females and 2 males, Suigen, Chosen, August, 1923 (Clausen). Deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences: Four females and 2 males to each, of the same lot as the above. Deposited with the United States National Museum: From Suigen, Chosen, 4 males, August 17 and 21, 1922 (King); 1 female, August 23, 1923 (Sato); 1 female, August 23, 1923 (Sato), Gardner No. 4; 2 females, August 25, 1923 (Sato), Clausen No. 1854; 2 males and 40 females, August, 1923 (Clausen); 1 female,

August 15, 1925 (Sato), Gardner No. 3; 2 females, September, 1925 (Gardner), Gardner No. 3, Clausen No. 1854; 2 females, September 23, 1925 (Gardner), Gardner No. 3, Clausen No. 1854; 1 female, September 23, 1925 (Sato), Gardner No. 3; 1 male reared August 23, 1926 (Gardner), Exp. 210; 1 female, insectary reared, Riverton, Exp. 219; 1 male insectary reared, Riverton, Exp. 319; 8 males and 2 females. From Koiwai, Japan, 2 females imported. From Nanking, China, 1 male, June 12, 1924 (Jaynes); 1 male, July 24, 1924 (Illingworth); 2 females, August 6-7, 1924 (Wong), Nos. 43 and 45; 12 males, September 24-30, 1924 (Jaynes); 1 male, October 1, 1924 (Jaynes). From Chinking, China, 3 males, July 7, 1924; 1 male, July 20, 1924 (Illingworth); 6 males, July 2-26, 1924 (Jaynes); 30 females, July 26-August 26, 1924 (Jaynes); 8 males and 1 female, reared September 10-17, 1924, from eggs laid July 10-August 3, 1924 (Jaynes); 3 males, August 9, 1924 (Jaynes); 1 male, June 26, 1925 (Jaynes); 1 female, July 5, 1925 (Wong); 10 females, 1925, "parasite on E grubs"; 21 females, 1925, numbered specimens; 2 females, no date, lettered specimens; 1 male without label. From Yangchow, China, 2 males, August 7-15, 1924 (Wong); 2 females, August 15 and 24, 1924 (Wong); 1 female, August 24, 1924 (Jaynes), No. 82. From Penniu, China, 1 female and 2 males, June 25, 1925 (Wong); 2 females, July 1, 1925 (Wong); 1 female, July 21, 1925 (Wong); 160 numbered females, 1925 (Wong); 3 females, September 22 to October 7, 1925, with ovipositional data (Wong); 4 females with ovipositional data (Wong); 2 females numbered, but without date; 1 female, September 29 (no year), presumably from Penniu; 5 females, with ovipositional data, presumably from Penniu; 1 female, reared from No. 105, presumably from Penniu; 6 females, 1926 (Wong), Jaynes No. 113. From Zakow, China, 1 male, June 24, 1924 (Jaynes). From Hangchow, China, 38 females, numbered specimens, September 19-October 24, 1924 (Chao); 1 male, August 31, 1924 (Jaynes); 1 female, June 26, 1925 (Jaynes); 7 females, July, 1925 (Jaynes); 1 male, June 17, 1926 (Chao); 1 female, July 21, 1926 (Chao). From Kuliang, China, 1 female, July 9, 1925, C1; 1 male, August 19, 1925; 1 male, 1926 (Jen). From China, 62 females and 8 males, reared at Riverton, Exp. 31; 3 males, insectary reared, Exp. 207; 1 male, reared, No. 135; 1 male, August 8, 1927.

Seven females, Suigen, Chosen, August 20, 1923 (Clausen), and 2 females, Suigen, Chosen, August 26, 1922 (King), formerly paratypes of *popilliavora* have been placed under *phyllophagae*.

An unlabeled female and another from Suigen, Chosen, August, 1923, resemble *popilliavora* in having a line of several minute punctures on the vertex dorso-medially and in having no well defined groove on the center of the sides of the pronotum, but they have the

typical minute, sparse punctures on the dorso-pronotum and the vestigial medial mandibular groove of *phyllophagae*. A number of females which have been examined vary toward *ovinigris* in having the punctures of the transverse discal band of the dorsal portion of the pronotum more uniform in size and larger toward the lateral angle than in the typical *phyllophagae*. These seem on the whole, however, to be nearer the latter species than *ovinigris*, and have been referred to it. The specimens include 5 females from Penniu, China, 1925, 4 of which are labeled Nos. 130, 232, 263, and 293, respectively, 2 from Hangchow, China, X-3-1924 and VII-1925, 1 from Chinkiang, China, No. 20, 1925, and 1 from Suigen, Chosen, August 19, 1923. A male from Nanking, China, X-1-1924 (Jaynes), has a truncate, thickened apex to the clypeal extension, and the tegula is somewhat blacker than usual.

Material of this species from Chosen has been known for some time to the workers of the Japanese Beetle Project as Gardner No. 3, equalling Clausen No. 1854. Some of the Chinese material from Hangchow, Chinkiang, and Penniu was designated as Jaynes No. 113. One specimen from Chosen labeled Rohwer No. 7 belongs here. Association of the two sexes was made with the aid of collecting data and was confirmed by rearing male and female progeny of known females from China Exp. No. 31.

21. TIPHIA OVINIGRIS, new species

Female.—Differs from the description of the female of *phyllophagae* only in the following respects. The lateral expansions of the transverse discal band of punctures on the pronotum without three or four punctures which are very much larger than the other punctures in the discal band; punctures at the apex of the discal band, immediately anterior to tegula, approximately as large as those mediad of this point; lateral discal punctures of the dorsal aspect of pronotum somewhat larger than those of the same region in *phyllophagae*, being small primaries. Length, 11 to 13 mm.

Male.—Not known.

Distribution.—Keikido, Chosen.

Type.—Cat. No. 41790, U.S.N.M. Female, Suigen, Chosen, September 11, 1924 (Sato), Gardner No. 12 equals Clausen No. 1861.

Paratypes.—All females, from Suigen, Chosen. Retained in the collection of the Japanese Beetle Laboratory: One, September, 1926 (Gardner), Gardner No. 12 equals Clausen No. 1861. Deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences: One from the same lot to each. Deposited with the United States National Museum: Two, August, 1923 (Clausen); 2, September 11, 1924 (Sato),

Gardner No. 12; 3, September 11, 1924 (Sato), Clausen No. 1861; 1, September 11, 1924 (Sato), Clausen No. 1856; 2, September 9 and 11, 1925 (Sato), Gardner No. 12; 4, September, 1925 (Gardner), Gardner No. 12; 8, September, 1926 (Gardner), Gardner No. 12.

This species is biologically distinct from *phyllophagae*. It has been known to Japanese beetle parasite workers in the Orient as Clausen No. 1861 and Gardner No. 12.

22. *TIPHIA INCONSPICUA*, new species

Plate 2, fig. 14

Female.—Vertex with primary punctures of second-degree density between and behind ocelli, elsewhere of third-degree density and with nearly impunctate spots on either side of medial patch. Front very faintly shagreened, with a short, narrow carina; primary punctures usually of third-degree density and evenly distributed over front, except in a narrow area along inner orbits, where they are of first-degree density. Impunctate apex of clypeal extension defined by a somewhat irregular row of coarse punctures, with its length equal to about half the distance from apex of clypeus to base of antennae. Mandibles with a median groove. Pronotum faintly shagreened, with its transverse carina usually complete but very weak; punctures much denser medially than on lateral disks, those just before impunctate apex much the largest although no discal band distinctly differentiated, punctures on lateral disks of third-degree density, definitely primaries though small; medial longitudinal extension of punctate area distinctly less than the impunctate. Sides of pronotum with a distinct groove across the center, and frequently with sparse punctures on upper half. Metanotum sparsely punctate, its largest punctures much smaller than the largest of the scutellum. Legs with major calcarium of hind tibia with a bend near middle, where it is slightly wider than at the base; hind basitarsus with a groove, and with four stout spines on the outside, one of which is apical. Propodeal areola subrectangular, from two to two and one-half times as long as wide; lateral carina bordered by grooves; median carina complete or nearly so; enclosed area smooth. Lower portion of sides of propodeum finely striate, and clothed with exceedingly fine, appressed hair. Posterior aspect of propodeum with scattered, round punctures antero-medially; median carina narrow, and complete or nearly so. First tergite with its preapical band consisting medially of a single, irregular row of punctures, expanding to several rows laterally, punctures distinctly separated only on posterior border. First sternite with its lateral groove developed on posterior half and again at constricted base, connected by a line of interrupted gorges; punctures or other sculpturing nearly lacking. Tergites

2 to 5 with impunctate margins at middle about three times the width of largest apical primary punctures. Pygidium densely and uniformly punctate on lower three-fifths, with a small, nearly impunctate emargination; apex wrinkled and strongly shagreened. Length, 9.5 to 11 mm.

Male.—Differs from the closely related *phyllophagae* in the following characters. The clypeoantennal distance is one and one-fourth times the apical width of the clypeal extension. The propodeal areola is without concave sides, being apparently longer, at least one and one-half times its width, and only very slightly convergent; the median carina is variable in length, but is usually half as long as the areola, scarcely thicker than the lateral carinae, and not broadly flattened on top. Denticle of fifth sternite is vestigial and much less conspicuous; no denticles on the two preceding sternites.

Distribution.—Chekiang and Fukien, China; Iwate and Kanagawa, Japan.

Type and allotype.—Cat. No. 41791, U.S.N.M. Type, female, Hangchow, China, September 18, 1924, K4; allotype, male, Kuliang, China (Jen).

Paratypes.—In the collection of the U. S. National Museum: Three females from Hangchow, China, labeled, respectively, September 19, 1924, O4, September 20, 1924, W4, and September 9, 1925, Y6 (Chao); from Ningpo, China, 4 females labeled, respectively, July 1, 1925 (Jaynes), August 28, 1925, D8, September 3, 1925, D10, and September 8, 1925, D17; from Kuliang, China, 9 females, August 16, 1926 (Jen), 1 male, August 29, 1926 (Jen), 6 females, 1926 (Jen), 2 males, September 1, 1926 (Jen); from Koiwai, Japan, 4 females, September 1, 1921 (Clausen); from Yokohama, Japan, 1 female, September 1, 1921 (Clausen); from Tokyo, Japan, 1 female, November 21, 1921 (King). Retained in the collection of the Japanese Beetle Laboratory: One female, Hangchow, China, August 19, 1924, S2; 1 male, Kuliang, China (Jen). Deposited in the collection of the Illinois Natural History Survey: One female, Hangchow, China, September 4, 1924, Y3; 1 male, Kuliang, China (Jen). Deposited in the British Museum: One female, Ningpo, China, July 27, 1925 (Jaynes); 1 male, Kuliang, China (Jen). Deposited in the Philadelphia Academy of Natural Sciences: One female, Ningpo, China, September 11, 1925; 1 male, Kuliang, China (Jen).

A number of males were collected at Kuliang, China, together with females of *inconspicua*, and were associated with the females on the basis of this fact and of the unquestionably close resemblance to *phyllophagae* paralleling the resemblance between the females of these two species.

23. TIPHIA NERVIDIRECTA, new species

Female.—Vertex strongly shagreened; primary punctures of second-degree density between the ocelli, but elsewhere of third-degree density, with an area just posterior to ocellar triangle not more densely punctate than area on either side; sparse secondaries on lateral vertex. Front strongly shagreened, with very regular, round punctures; groove interrupted; primary punctures barely of first-degree density on the anterior half, where they are not denser medially, of third-degree density above, without symmetrical impunctate areas. Clypeal extension with its impunctate margin half as long as the clypeoantennal distance. Pronotum shagreened; primary punctures in the well-defined discal band and in a small medial patch of first-degree density, those on lateral disks of sparse third-degree density; secondary punctures sparse apico-medially, not present on disks; punctate area medially much narrower than the impunctate. Side of pronotum with a pronounced groove across the center. Metanotum with numerous primary punctures nearly as large as those of the scutellum. Legs with the major calcarium of the hind tibia widest at the bend near the middle; hind basitarsus with groove, on outside with row of three long spines, one of which is apical. Tegulae faintly shagreened. Propodeal areola shaped like the cross section of a biconcave lens, two and one-quarter times as long as wide; carinae bordered by crenulate grooves interrupted by many transverse ridges; median carina extending to lowest tenth of areola; enclosed areas conspicuously shagreened. Lower portion of sides of propodeum polished, striate, with dense, minute hairs on posterior half. Posterior aspect of propodeum with median carina on lower half bordered and capped by coriaceous sculpturing. First tergite with its preapical band consisting medially of a single row of very regular punctures, expanded laterally without coalescence of punctures. First sternite with lateral grooves on posterior half having small, shallow punctures anteriorly. Tergites 2 to 4 with impunctate margin slightly wider medially, where it is three to four times the width of adjacent primary punctures. Pygidium reticulopunctate on upper three-fifths, rather sparsely so toward middle; impunctate apical section plainly shagreened and wrinkled longitudinally and about the posterior margin. Length, 9 mm.

Male.—Not known.

Distribution.—Chekiang, China.

Type.—Cat. No. 41792, U.S.N.M. Female, Hangchow, China, July, 1925 (Jaynes).

Paratype.—One female, from the same lot as the type, in the collection of the Japanese Beetle Laboratory.

The female of this species has the following characters, by which it can be separated readily from the female of the closely related *inconspicua*: The medial patch of dense primary punctures on the vertex is lacking, but the secondary punctures on the lateral portion of vertex are more numerous; the latero-apical process of the metasternite is not bidentate on the surface facing the hind coxa; the second intercubital vein is straight, or at least not acutely bent near the middle, and joins the radius at a point as far from the wing base as its posterior origin in the cubitus.

24. *TIPHIA MALAYANA* Cameron

Tiphia malayana CAMERON, Entom. Rundts., 27 Jahr, p. 130, 1910.

Tiphia sp. no. 114 KING, ALLEN, and HALLOCK, Journ. Econ. Ent., vol. 20, p. 371, 1927.

Female.—Vertex with primary punctures largely of third-degree density, with medial patch slightly denser than patches on either side; several minute punctures on medial line near posterior declivity. Front slightly shagreened on lower half; usually no carina or impunctate stripe; primary punctures of first-degree density from eye to eye on lower third and upward to vertex along inner orbits, of third-degree density in front of ocelli, everywhere regular in spacing. The length of the impunctate margin of the clypeal extension nearly one-half as great as the clypeoantennal distance. Antenna with the third joint distinctly shorter than its greatest width; flagellum fulvous beneath. Pronotum with the primary punctures of uniform size and well differentiated from secondaries, of first-degree density except for small latero-discal spots; transverse discal band not differentiated. Side of pronotum with a deep, continuous groove across the center, but lacking other conspicuous sculpturing. Metanotum with the largest punctures much finer than those of the scutellum. Legs with major calcarium of hind tibiae distinctly widest at bend near middle; hind basitarsus with a shallow groove half the length of joint, outside with a row of three long, lanceolate spines, of which one is apical. Tegula red to black, rarely transparent; inner posterior angle produced and densely pilose, with several sub-erect hairs arising above the tegulae when viewed from across the dorsum. Wings faintly smoky; stigma more than twice as long as wide, extending laterally in broad curve from junction with radius. Propodeal areola slightly convergent, distinctly keystone-shaped, from two to two and one-half times as long as wide; carinae sharp and narrow, bordered with well developed grooves; median carina extending nine-tenths the distance to transverse carina. Lower portion of side of propodeum shagreened, usually with a large patch of very minute, dense hairs.

Posterior aspect of propodeum with median carina flattened, bordered by shallow impressions, and extending to the transverse carina. First abdominal tergite with the apical band consisting of punctures about one row wide at the center, widening at the sides into a depressed patch of coalesced punctures. First sternite with lateral groove on posterior three-fourths; other fourth coriaceous; disk lacking the usual dense, minute punctures. Tergites with preapical setigerous punctures becoming subdiscal medially where impunctate apex is at least four times width of nearby primary punctures; a row of minute punctures appearing on sides, but not on dorsum back of the preapical setigerous row of punctures. Pygidium uniformly reticulo-punctate on basal half; apex scarcely wrinkled. Length, 7.5 to 10.5 mm.

Male.—Vertex with primary puncture in dorso-medial patch of first-degree density. Front strongly shagreened; preocellar area on upper half with primary punctures of regular second-degree and third-degree density and with interspaces much broader than ocellus; secondary punctures nearly lacking, though primaries gradually diminish in size toward base of antennae. Antennocular distance less than the width of antennal fossa. Clypeal extension with its apical width slightly greater than the clypeoantennal distance; disk flat but protruding; apex distinctly roundly emarginate, with thick punctate margin. Flagellum often broadly infuscated beneath. Pronotum faintly shagreened; primary punctures small, and largely of third-degree density; several secondary punctures antero-medially. Side of pronotum striate, with strong groove, more or less interrupted by diagonal rugulae, crossing center in a broad curve; no punctures. Mesepisternum conspicuously shagreened; primary punctures diminishing in size and density away from the prepectus, everywhere of third-degree density; secondary punctures conspicuously less numerous than primaries over a vaguely defined area in center anterior to spiracle. Scutellum without impunctate apex as wide as the lowest primary punctures. Metanotum variable. Tibiae and femora sometimes partially reddish. Tegula polished and faintly shagreened, varying from transparent reddish to opaque black. Wings sub-hyaline, with radial cell exceeding second cubital cell in apical extension. Propodeum with its transverse carina extending far forward medially; areola about one and one-fourth times as long as wide, its sides slightly convergent, the lateral carinae somewhat crenulate on the outer border, the medial carina tapering to apex which is situated just before transverse carina; inclosed area flat, granulate; lower portion of sides of propodeum densely striate, not finely hairy or punctate; posterior aspect densely hairy, punctate except on the conspicuous, polished, impunctate spots above, with a median carina present on lower half

or less. First tergite with preapical band narrow, usually abruptly impressed on the anterior margin and with the punctures differentiated only on the posterior border. First sternite with the posterior fossa weakly crenulate, disk polished, impunctate, with the lateral grooves extending forward a variable distance, sometimes to anterior apex; constricted portion with an elongate median keel. Tergites 3 to 5 with punctures not clearly outlined, apical ones larger than the more densely grouped anterior ones; impunctate margins at most about three times as wide as width of largest adjacent primary punctures. Length, 5 to 7 mm.

Distribution.—Borneo; Fukien, Chekiang, and Kiangsu, China; Keikido, Chosen.

The descriptive notes on the female and the description of the male are based on a selected specimen of male from Kuliang, China, 1926 (Jen), placed in the United States National Museum and on the following specimens in the collection of the Japanese Beetle Laboratory: From Suigen, Chosen, 1 female, June 3, 1922 (King), King No. 9; 1 female, April 30, 1924 (Sato), No. 6; 2 females, May 1, 1924 (Sato), Clausen No. 1857; 1 female, May 1, 1924 (Sato), No. 6. From Chinkiang, China, 2 females, July 2 and 7, 1924, Nos. B and P; 6 males, July 4 to 7, 1924 (Jaynes); 1 male, July 7, 1924 (Illingworth); 1 male, July 7, 1924; 7 females July 7 to 12, 1924 (Jaynes); 8 females, July 20 to 26, 1924 (Illingworth), "ex. hedge"; 1 female, July 28, 1924, No. 0; 1 female, August 4, 1924, No. 37; 1 female, No. 3; 1 female, June 24, 1925 (Jaynes); 160 females, China, 1925, Riverton Exp. No. 120. From Hangchow, China, 100 females, April 5 to June 9, 1925 (Chao); 17 females, April 14 to May 11, 1926 (Jaynes); 7 females, May 5 to 14, 1926 (Chao). From Kuling, China, 14 females, May 15 to June 25, 1926 (Wong); 1 female, August 21, 1926 (Wong). From Kuliang, China, 1 female, June 20, 1925, No. A1; 3 males, August 4 to 16, 1926; 24 males, 1926 (Jen). From Yangchow, China, 1 female, August 14, 1924 (Wong). Representative specimens have been deposited in the collections of the United States National Museum, the British Museum, the Philadelphia Academy of Natural Sciences, and the Illinois Natural History Survey.

Our concept of the species is based on females from our collection compared with the type female from Borneo in the British Museum by Mr. Gahan, who writes that he could see no difference except in size, the type being larger. This species has been referred to in the notes and articles published by the workers of the Japanese Beetle Project as Jaynes No. 114, Clausen No. 1857, King No. 9, and Rohwer No. 10. The association of sexes in this species was made from collecting data, males and females having been taken together at Chinkiang, China, under circumstances indicating that they were of the same species.

25. *TIPHIA BREVISTIGMA*, new species

Female.—Closely resembles *malayana*, but differs from it, according to our descriptive notes, as follows: Punctures of vertex largely of first-degree or second-degree density, with several rather broad, irregular, impunctate interspaces; the group of minute punctures on the medio-dorsal line lacking. Third antennal joint slightly longer than its greatest width. Pronotum shagreened. Metanotum broadly impunctate anteriorly. Groove on hind basitarsus vestigial, scarcely half the length of joint. Stigma truncate at apex, less than twice as long as wide, with radius fused with it at its apex. Median carina of the posterior aspect of the propodeum confined to its lower third and not bordered with grooves. Preapical band of first tergite not impressed laterally. First sternite not coriaceous on its constricted base; lateral grooves plainly complete to escutcheon. Length, 8 mm.

This species seems to be allied to *compressa*, from which it may be separated readily by the difference in size and the absence of the unusual diagonally longitudinal carinae present on the dorsum of the propodeum in *compressa*.

Male.—Not known.

Distribution.—Assam, India.

Holotype.—Cat. No. 41794, U.S.N.M. Female, Shillong, India.

26. *TIPHIA COMPRESSA* Smith

Tiphia compressa SMITH, Cat. Hymen. Brit. Mus., pt. 3, p. 82, 1855.

Female.—Vertex with a few punctures of first-degree density just back of ocelli; farther back, with punctures of third-degree density, laterally nearly impunctate. Front with pronounced impunctate stripe and interrupted groove; primary punctures very large, densest above antennae, but of first-degree density in all parts except a limited area below ocelli. Clypeal extension impunctate for nearly half the distance from its apex to base of antennae. Flagellum of antenna fulvous beneath. Pronotum polished; its primary punctures very large, and of first-degree density in all parts except a small area antero-medially to which the small, sparse secondaries are confined; discal band not well defined; medially, the punctate area distinctly narrower than the impunctate. Side of pronotum with a shallow, curved groove extending about half way across the middle, with numerous widely separated punctures on the upper half. Metanotum with its sparse primaries nearly as large as those of scutellum. Legs with major calcarium of hind tibia tapering gradually from the base; hind basitarsus with vestigial groove scarcely one-fifth length of joint and becoming shallower apically; on outside with group of three to four long, curved spines, with one at apex. Wings with first cubital mark vaguely defined. Propodeal

areola vase-shaped in outline, two times as long as wide, with five longitudinal carinae, lateral carinae without bordering grooves, median carina complete or extending to lowest eighth of areola, bordered by two sinuous carinae which extend only to lower half or third. On dorso-propodeum at either side of areola there occurs a vague diagonal carina, and just anterior to the lateral terminus of the transverse carina there is an unusual carinate angle. Lower portions of sides of propodeum finely striate; with very fine, dense hairs on posterior half. Upper portion of side with its longitudinal rugae unusually sharp and regular. Posterior aspect of propodeum scarcely coriaceous laterally, with sparse, small primaries on upper half; median carina complete, flattened, and marked by bordering grooves. First abdominal tergite with preapical band consisting of a single row of regular, well separated punctures, laterally somewhat vaguely expanded and impressed. First sternite very flat, smooth, and free from primary punctures, with lateral groove on posterior third. Tergites 3 to 5 with impunctate margins not equal to average diameter of larger adjacent primary punctures. Pygidium densely punctate on basal three-fifths, apex not wrinkled, except at sides, but strongly shagreened. Length, 12 to 13 mm.

Male.—Not known.

Distribution.—Fukien, China (type, China; restricted locality not known); Philippines.

Of the 6 females from Kuliang, China, collected August 16 to October 10, 1926 (Jen), single specimens have been deposited in the collections of the United States National Museum, the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences, and two are retained in the collection of the Japanese Beetle Laboratory.

The descriptive notes were made from the specimens listed above. This material was first identified from Gahan's notes on the type in the British Museum and from his excellent figure of the highly characteristic dorsal propodeum. One of the above specimens was later compared with the type by Doctor Waterston, who verified our determination. Waterston says, however, that the type is a little larger than our specimens, and Gahan says that the tibiae are more or less reddish.

27. *TIPHIA BICARINATA* Cameron

Plate 1, figs. 2, 5, 7; plate 2, fig. 11; plate 3, fig. 24

Tiphia bicarinata CAMERON, Entomologist, vol. 35, p. 239, 1902.

Female.—Vertex with its irregular impunctate spaces somewhat elevated above the general surface, primary punctures of first-degree density in patches near upper eye and between ocelli, elsewhere of

second-degree density. Front perceptibly shagreened below, with a short, irregular, impunctate stripe and a very distinct narrow carina having a well defined groove on its apex; primary punctures elongated toward ocelli, irregularly distributed toward the vertex, much denser and more evenly distributed on the lower half, denser medially than toward the eyes; combined area of the punctures exceeding that of their interspaces over the greater part of front. Clypeal extension with its primary punctures mixed with minute secondaries which extend irregularly nearly to apex, leaving no well defined impunctate apex. Antenna with its first joint sharply angulate apico-ventrally; third joint slightly longer than the greatest width. Pronotum with transverse carina complete and very strongly developed; primary punctures very large, their posterior margins sloping out to surface, evenly distributed, their total area much exceeding that of the interspaces; secondary punctures very sparsely and widely distributed; transverse discal band lacking; median longitudinal extension of the punctate area about equal to that of the impunctate area. Side of pronotum usually with a very shallow, scarcely perceptible groove across the center, which is, however, somewhat more conspicuously marked than the irregular grooves or striae above and below the central groove; punctures more or less distinctly separated in a wide band just behind the carina; a round, deeply concave spot near the alar angle bordered anteriorly by concentric ridges. Scutum with the notauli and antero-medial grooves continuous. Mesepisternum with a premarginal crease, (not a groove), on its posterior slope. Metanotum usually divided by a shallow medial depression; densely bipunctate, the primary punctures nearly as large as those of the scutellum. Legs with the major calcarium of the hind tibia widest just before middle; hind basitarsus with a very deep, long groove; outside with a group of two to several sharp, stout spines, one of which is apical. Tegula usually partially shagreened; latero-anterior border with vague impression, hind border with raised edge, in front of which there is often an oval, shallowly impressed area more clearly defined laterally. Wings moderately smoky; first cubital mark usually quite conspicuously developed. Propodeal areola keystone-shaped, two times as long as wide, the enclosed area somewhat reticulate; median carina sometimes complete but usually more or less broken. Lower portion of sides of propodeum polished, striate, with posterior half minutely setulo-punctate. Posterior aspect of propodeum sparsely punctate on disk; carina tapering abruptly, and confined to lower half or less. First tergite with a preapical band of a single, well differentiated row of primary punctures. First sternite flat, polished, and without sculpturing save a few large punctures on anterior sides dwindling rapidly towards rear; no lateral grooves.

Intermediate tergites with apical rows of punctures closely parallel to apex, and bearing even rows of coarse yellow hairs; sternites with similar apical rows. Pygidium black, rugose-reticulate at base, the rugae parallel on apical half and extending to tip, apical half not faintly wrinkled and impunctate as is usual in other species. Hypopygium with a narrow medial impunctate stripe on lower half. Length, 11–14 mm.

Male.—Vertex with primary punctures back of and between ocelli of first-degree density. Front with very distinct impunctate stripe, becoming carinate anteriorly; densely covered on upper three-fourths with primary punctures which are deep, irregular, elongated upward, and separated by spaces much less than width of punctures; no preocellar region of sparse punctures; secondary punctures sparse, ascending higher on sides than medially, confined to lower third or less. Antennocular distance greater than width of antennal fossa. Clypeal extension with its width four-fifths the clypeoantennal distance; apex moderately emarginate; impunctate margin lacking. Pronotum with punctures large and deep, mostly of first-degree density, rugoso-punctate toward carina, with a tendency toward grouping in rows of four and five and to the formation of polygonal outlines where crowded; secondary punctures not present; side of pronotum with wide, polished sulca across the middle, sometimes interrupted by low, diagonal rugae. Mesepisternum with center of disk not shagreened, primary punctures very large, deep, and clearly outlined, of first-degree density; secondary punctures well differentiated, less abundant than the primaries, at least on apex of convexity; line along the posterior border impressed but not incised. Scutellum with impunctate apex not as wide as largest apical primary punctures. Metanotum with coarse primary punctures somewhat smaller than the largest on the scutellum, combined area of punctures exceeding the area of their interspaces. Tegula obscurely shagreened, with a heavy, marginal impressed line about the outside border, sometimes interrupted or even lacking altogether. Wings with first cubital mark very distinct; radial cell not equaling second cell in apical extension. Propodeum with the areola scarcely longer than wide, its sides strongly convergent, the bordering carinae higher posteriorly; median carina of areola present on upper two-thirds or less; enclosed area flat, and usually polished; disk of dorsum outside of areola sparsely coarse-punctate; lower portion of sides striate, without minute hairs posteriorly; posterior aspect strongly concave, with median disk sharply bipunctate and median carina present on lower half or less. First tergite with preapical band narrowing to a single, close-set row of coarse punctures which are not sunk in a depression.

First sternite with extremely fine punctures on disk, and coarser ones toward apex; lateral groove on posterior half or less, often absent, anterior half with median punctate process but without the usual keel. Tergites not shagreened, with coarse punctures terminating in even rows, removed from apices by distances scarcely exceeding the width of the punctures; tergites 2 to 6 with apical rows of coarse brown hairs; marginal incised line complete over dorsum; sternites 2 to 5 with conspicuous apical rows of brown hairs; fifth sternite with lateral process weakly developed or altogether absent. Length, 9 to 10.5 mm.

Distribution.—Japan; Keikido, Chosen; Fukien, China.

The description of the male and the descriptive notes on the female are based on a selected male specimen from Suigen, Chosen, insectary reared, Jap. Beetle Par. Exp. No. 335, and the following specimens in the collection of the Japanese Beetle Laboratory: From Kowai, Japan, 1 female, August 1926. From Suigen, Chosen, 1 male, May 10, 1923 (Clausen); 1 female, August 10, 1924 (Sato), Clausen No. 1860; 1 female, August 15, 1925 (Sato), Gardner No. 15; 2 females, August 19, 1926 (Gardner); 3 males and 1 female, August 23, 1926, Exp. 210 (Gardner); 1 female, August 26, 1926 (Gardner); 1 female, August 29, 1926, Exp. 210 (Gardner); 24 females, August 1924 (Gardner), Gardner No. 15; 17 males and 27 females, insectary reared, Riverton Exp. 210, 1926; 29 males and 3 females, insectary reared, Riverton Exp. 335, 1927; 1 male, insectary reared, Exp. 335, August 9, 1927; 6 males, insectary reared, August, 1927; 2 females, insectary reared, Riverton Exp. 310, 1927; 1 female, insectary reared, Riverton Exp. 316; 2 females, insectary reared, August 1927; 1 male Gardner No. 15. From Kuliang, China, 2 females, August 16, 1926 (Jen), and 1 male, 1926 (Jen).

One additional female, Suigen, Chosen, August 19, 1925 (Clausen) Rohwer No. 11, placed here although it varies from the typical form in having no impunctate stripe on hypopygium. The specimens from China are very poor, and are not suitable for a thorough comparison. They vary slightly from the other material, but if they are not of this species they are exceedingly close to it. Representative specimens have been deposited in the collections of the United States National Museum, the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences.

Specimens in our collection from Suigen, Chosen, were compared with the type in the British Museum by Gahan and Waterston, both of whom consider them to be of the same species. The type is labelled "Japan, 21.7.81. (Cameron coll. 1901-261.)" It is a female, although in the original description it is listed as a male. This

species has been known to the workers of the Japanese Beetle Laboratory as Clausen No. 1860 and Gardner No. 15. Rohwer has designated it by his species No. 11. The association of sexes is based on rearing records. Females have been taken in the field in large numbers in Chosen, and are represented in our collection by specimens collected by Gardner and labelled "Gardner No. 15." Their progeny have been reared, emerging in New Jersey (Exps. Nos. 210 and 335).

23. *TIPHIA BREVILINEATA*, new species

Female.—Vertex with primary punctures of first-degree density in irregular patches near upper eye, of second degree between and behind ocelli, and of third degree on either side with intervening spaces nearly impunctate. Front polished; carina and impunctate stripe scarcely differentiated; groove usually well developed; primary punctures of first-degree density from eye to eye on lower third and along inner orbits inward toward ocelli, below ocelli of third-degree density, with vague impunctate areas. Clypeus with its primary punctures interspersed with minute punctures extending nearly to apex, leaving no well-defined impunctate margin. Mandibles with short, shallow medial groove. Antenna with its first joint sharply angulate apico-ventrally. Pronotum with its transverse carina complete and very strongly developed; primary punctures of first-degree density just back of the carina and in the fairly well-differentiated transverse discal band, of third degree on lateral disk, and with secondary punctures lacking or very sparse; medial longitudinal extension of punctate area distinctly less than that of impunctate area. Side of pronotum with indistinct sculpturing across the center, primary and secondary punctures sparsely scattered over the anterior third and along the dorsal margin; a deep auricular depression at the alar angle. Scutum with its notauli and its antero-medial groove continuous. Mesepisternum with a vague premarginal crease on its posterior slope. Metanotum with its coarse punctures nearly equalling those of scutellum. Legs with major calcarium of hind tibia distinctly widest at the bend near the middle; hind basitarsus with the groove pronounced, its outside spines principally in rows of three, broadly lanceolate, one apical. Tegula considerably longer than broad, inner hind angle slightly produced. Propodeal areola variable in outline, one and one-half to two times as long as wide; carinae without pronounced bordering grooves; median carina weakest at middle, nearly or quite complete; enclosed area reticulate apically. Lower portion of sides of propodeum polished, striate, with a small but well-defined setigerous patch. Posterior aspect of propodeum weakly coriaceous at the

sides and above; median carina varying from poorly developed to nearly complete. First abdominal tergite with a preapical band consisting of a well-differentiated single row of punctures in a narrow depression. First sternite flat, without lateral groove; sparse, deep punctures anteriorly. Tergites 4 and 5 without impunctate apices of greater width than nearby primary punctures. Pygidium deeply rugose-punctate, with many sharp, black, longitudinal ridges extending to the extreme apex. Hypopygium with very narrow median impunctate stripe confined to the apical third or less. Length, 8.5 to 13 mm.

Male.—Not known.

Distribution.—Keikido, Chosen.

Type.—Cat. No. 41796, U.S.N.M. Female, Suigen, Chosen, July, 1926 (Gardner), Gardner No. 9.

Paratypes.—All females from Suigen, Chosen. In the United States National Museum: One, July 1, 1927, Gardner No. 9. In the collection of the Illinois Natural History Survey: One, July 1926 (Gardner), Gardner No. 9. In the collection of the Philadelphia Academy of Natural Sciences: One, July 3, 1925 (Sato), Gardner No. 9. In the collection of the British Museum: One, July 5, 1925 (Sato), Gardner No. 9. Retained in the collection of the Japanese Beetle Laboratory: One, July 5, 1925 (Sato), Gardner No. 9.

This species has been known to the workers of the Japanese Beetle Project as Gardner No. 9.

29. TIPHIA CILICINCTA, new species

Male.—Vertex with a well-defined medial patch of primary punctures scarcely of first-degree density. Front with a low, linear, medial carina; primary punctures unusually large, round, and clearly outlined, with preocellar region large and having several interspaces as broad as ocelli; secondary punctures inconspicuous but present medially on lowest fourth. Antennocular distance less than width of antennal fossa. Clypeal extension with its apical width scarcely exceeded by clypeoantennal distance; apex shallowly emarginate, densely punctate to the thick margin; disk flattened. Pronotum with its punctures rather uniformly and sparsely of second-degree or third-degree density; secondary punctures lacking. Side of pronotum rather smooth and polished, with an interrupted groove extending in a broad curve from the border of the transverse carina to the rather densely punctate alar angle. Mesepisternum with clearly outlined primary punctures of third-degree density, their interspaces, excepting those of the posterior aspect and of the antero-dorsal corner, with a very few, minute secondary punctures which are less

numerous than the primaries. Scutellum with impunctate apex narrower than width of apical primary punctures. Metanotum impunctate medially, elsewhere densely bipunctate, the primary punctures scarcely half as large as the largest of the scutellum. Tegula shagreened, without abruptly thickened margins. Wings hyaline; radial cell far exceeding second cubital cell; first cubital mark outlined by distinct folds and sometimes by a distinct spur arising from the first abscissa of the radius. Propodeal areola with curved, convergent lateral carinae which do not become higher as they approach the apex, length of areola scarcely exceeding its basal width, median carina inflated, usually terminating before apex of areola, enclosed area coarsely reticulate; lower portion of sides faintly striate, without perceptible hairs; posterior aspect smoothly and finely setulopunctate, without a median carina. Preapical band of first tergite present, sometimes with its anterior border abruptly impressed, at least for part of its length, rather wide though constricted at center, with numerous coalesced punctures, but always with a row or partial row of deep, well-separated primary punctures on posterior border. First sternite distinctly bipunctate, with a moderate number of fine, setulose punctures on disk; lateral groove continuous to escutcheon, antero-medial keel present. Tergites 2 to 5 with apical rows of uniformly round, deep punctures, and bearing very dark, coarse hairs which are arranged in an even row; impunctate margins obsolete. Sternites 2 to 5 with apical rows similar to those of the dorsum but even more conspicuously developed. Sternal denticles lacking. Length, 8.5 to 9.5 mm.

Female.—Not known.

Distribution.—Fukien, China.

Type.—Cat. No. 41797, U.S.N.M. Male, Kuliang, China, August 27, 1926.

Paratypes.—All males, Kuliang, China. Retained in the collection of the Japanese Beetle Laboratory: One, August 30, 1926. Deposited in the collection of the British Museum: One, August 28, 1926. In the collections of the Illinois Natural History Survey and the Philadelphia Academy of Natural Sciences: One each, labeled August 25, 1926. Deposited in the United States National Museum: Three, 1926 (Jen).

30. *TIPHIA FUKIENSIS*, new species

Plate 2, fig. 10

Male.—Vertex with primary punctures of nearly first-degree density in a patch behind the ocellar triangle and beside the eyes, intervening space nearly impunctate. Front shagreened, with a median linear impression extending nearly to ocellus; primary punc-

tures large, round, very clearly outlined, their average diameter on the lower front much greater than the average interspace; precellar area large, with several interspaces nearly as broad as an ocellus; a few minute secondary punctures on lowest fourth. Antennocular distance slightly less than width of antennal fossa. Clypeal extension with its apical width about equal to the clypeoantennal distance; apex shallowly emarginate, with a thick, widely impunctate margin. Pronotum strongly shagreened; punctures of second-degree or third-degree density, regularly spaced, without trace of a transverse discal band; secondary punctures lacking. Side of pronotum finely striate, with a pronounced central groove interrupted by fine rugulae, and extending in a broad curve to the densely punctate alar angle. Mesepisternum with rather sparse, clearly outlined primary punctures; secondaries somewhat more numerous than the primaries in a median belt, above and below which they are almost lacking. Scutellum with impunctate apex narrower than the apical primary punctures. Metanotum sparsely and uniformly bipunctate, the larger primary punctures nearly equalling those of the scutellum. Tegula conspicuously shagreened, with an abruptly thickened, polished margin which is widest at the lateral posterior angle. Wings hyaline; radial cell far exceeding the second cubital cell; first cubital mark plainly outlined by fuscous tracings. Propodeum with its areola parallel-sided, scarcely longer than wide, median carina complete; transverse carina angulate at each junction with the longitudinal carinae, the junction with the lateral carinae located distinctly posterior to the junction with the median carina, inclosed area finely coriaceous; lower sides faintly striate, with a large patch of microscopic hairs; posterior aspect polished above, without median carina. First tergite vaguely concave in region of the preapical band, which consists of an irregular series of distinctly separated round punctures, and which has its anterior margin sometimes abruptly impressed at the sides. First sternite polished on posterior portion, shallowly punctate to coriaceous on anterior half, with lateral grooves on posterior half or less and again on constricted anterior portion, median keel broad and low. Tergites 2 to 5 with uniform apical rows of deep, round punctures, each tergite bearing an even row of coarse, brown cilia, and abruptly terminated behind these rows, without impunctate margins. Sternites 2 to 5 with apical rows of coarse hairs similar to those of tergites; fifth sternite with vestigial denticles on the sides. Length, 10 to 11 mm.

Female.—Not known.

Distribution.—Fukien, China.

Type.—Cat. No. 41798, U.S.N.M. Male, Kuliang, China (Jen).

Paratype.—A male from the same lot, retained in the collection of the Japanese Beetle Laboratory.

31. *TIPHIA ASERICAE*, new species

Female.—Vertex with a few series of primary punctures of second-degree density extending through and behind ocellar triangle, primaries denser medially than on either side. Front highly polished; groove present, though frequently interrupted; primary punctures sparse, denser on anterior third, where they are evenly distributed between the eyes, chiefly of second-degree density, except broadly on median upper front, where density is of third degree. Impunctate apex of clypeal extension poorly defined by an irregular row of coarse punctures, its longitudinal extension about one-third the distance from apex of clypeus to base of antennae. Flagellum of antenna fulvous beneath. Pronotum with its primary punctures nearly uniform in size; no definite transverse discal row or medial patch of punctures; secondary punctures sparse but well differentiated, widely scattered; medial longitudinal extension of punctate area slightly less than that of impunctate area. Side of pronotum without a groove across the center, but with striations in this region sometimes increased to short, shallow, irregular grooves. Scutum with its notauli and its antero-medial groove continuous or nearly so. Metanotum densely bipunctate on its periphery, with its largest discal punctures much smaller than those of the scutellum. Legs with major calcarium of hind tibia widest at bend near middle; hind basitarsus with groove, shallow and extending about one-half the length of joint, a group of three lanceolate spines on outside, one of which is apical. Tegula thin, red, polished, transparent. Wings slightly smoky. Propodeal areola almost rectangular, two and one-half to three times as long as wide; carinae narrow and uniform, bordered by conspicuous grooves; median carina on lowest three-fourths or complete. Lower portion of sides of propodeum shagreened, with patch of microscopic, appressed hairs. Posterior aspect of propodeum usually with scattered punctures antero-medially; median carina weak and flattened, sometimes complete. First abdominal tergite with well-developed preapical band of coalesced punctures in deep, narrow groove abruptly depressed on anterior border. First sternite with lateral groove on posterior half, and a few scattered punctures anteriorly. Tergites with polished impunctate margins medially about 3 to 4 times the width of largest bordering punctures. Pygidium uniformly reticulo-punctate on basal half, with polished, impunctate emargination; apex scarcely wrinkled, and not shagreened. Length, 8 to 8.5 mm.

Male.—Vertex with primary punctures everywhere of third-degree density. Front with rather small primary punctures, lacking usual patch of punctures on lower front; preocellar patch on upper half

very wide, with primary punctures of irregular second-degree and third-degree density and with interspaces broader than an ocellus; secondary punctures very dense below, not well differentiated from primaries on bipunctate area, ascending half way to lowest ocellus medially and about one-third of the way along eyes. Antennocular distance about equal to the width of antennal fossa. Clypeal extension with its apical width four-fifths the clypeoantennal distance; disk flat and not protruding; apex shallowly emarginate, lacking an impunctate margin, but with a thick edge. Pronotum with primary punctures small, fairly well outlined, largely of third-degree density; a few secondary punctures close to carina. Side of pronotum finely striate, without a definite medial groove. Mesepisternum with small, sparse, well-outlined primary punctures; secondary punctures dense on upper half and bordering the prepectus and posterior margin, less numerous than primaries only on the small callosity above the coxa; no premarginal groove, though appearing shallowly impressed in certain lights. Scutellum, except medially, with impunctate apex not as wide as largest apical primary punctures. Metanotum with dense secondary punctures apically, elsewhere with sparse primaries nearly equaling the largest of the scutellum in size. Tibiae and tarsi of first two pairs of legs mostly reddish. Tegula polished, translucent, red. Wings with radial cell slightly exceeding cubital cell. Propodeum with areola rectangular in outline, nearly twice as long as wide, lateral carinae without bordering groove, the median carina sinuous, the inclosed area somewhat rugose. Side with lower region not punctate or hairy but finely shagreened; posterior aspect densely hairy and punctate, with a median carina on lower half.

First tergite with preapical band narrow, deeply impressed, of nearly uniform width, its punctures fading out on surface of depression. First sternite with lateral groove on posterior third; disk with vague punctures and a sharp median keel anteriorly. Tergites 3 to 5 moderately shagreened, with punctures extending to apex. Fifth sternite with its lateral denticle appearing more like a crescent than a tooth. Length, 6.5 mm.

Distribution.—Keikido, Chosen; Iwate, Japan; Chekiang, China.

Type and allotype.—Cat. No. 41799, U.S.N.M. Type, female, and allotype, male, Suigen, Chosen, June 5, 1924 (Sato), Clausen No. 1859.

Paratypes.—All females. In the National Museum: From Suigen, Chosen, 19, June 5, 1924 (Sato), Clausen No. 1859; 1, June 5, 1924 (Sato), Gardner No. 8; 3, June 15, 1925 (Sato), Gardner No. 8; 2, June, 1925 (Gardner), Gardner No. 8, equals Clausen No. 1859. From Hangchow, China, 1, July, 1925 (Jaynes). From Kowai, Japan, 3, August, 1926. To the collections of the British Museum,

the Illinois Natural History Survey, the Philadelphia Academy of Natural Sciences, and the Japanese Beetle Laboratory: Two to each from Suigen, Chosen, June 5, 1924 (Sato), Clausen No. 1859.

Two females and one male, Koriyama, Japan, June 14, 1920 (Clausen), varying towards *agilis*, were deposited at the United States National Museum but were excluded from the type series. The specimens from China and Japan differ very slightly from the form from Chosen in having the preapical band less linear and less deeply impressed across the medio-dorsum. The association of male with female was made by Mr. Clausen, and is based on rearing work done in Chosen. This species has been known to the men in Japanese Beetle parasite work as Clausen No. 1859 and Gardner No. 8.

32. *TIPHIA AGILIS* Smith

Tiphia agilis SMITH, Trans. Ent. Soc. London, 1873, p. 184.

This species was identified by Mr. Gahan after comparison of a male in our collection from Suigen, Chosen, with the type male in the British Museum. The female is identical with *americae* in all characters used in our description, except that the side of the pronotum has a shallow, narrow, interrupted groove across its center, and that the length is slightly less, being 7.5 to 8.5 mm.

The male is characterized as follows: Vertex with primary punctures in a dorsal, medial patch, of first-degree density. Front faintly shagreened; preocellar area irregularly beset with primary punctures and with several interspaces as broad as the lowest ocellus; secondary punctures not well differentiated, a few ascending medially half way to ocellus, but not nearly so high beside the eyes. Antennocular distance equal to width of antennal fossa. Clypeoantennal distance one and one-fourth times width of clypeal extension at apex; punctures of extension continuous to the margin, which is slightly emarginate and not flattened. Flagellum broadly reddened beneath. Pronotum with small, poorly outlined primary punctures, of third-degree density outside the anterior medial patch; secondary punctures not apparent. Side of pronotum broadly striate, with irregular depression across the center interrupted by numerous rugae. Mesepisternum with primary punctures shallow and of sparse third-degree density; secondary punctures everywhere more numerous than primaries, except in a narrow area on the median surface between mesocoxa and tegula. Metanotum densely punctate, with punctures considerably finer than the coarsest punctures of the scutellum. Tibia and apices of femora of the first two pairs of legs red. Tegula reddish and semitransparent, except at base. Wings hyaline, with radial cell slightly exceeding second cubital cell.

Propodeal areola subrectangular; lower portion of side polished, shagreened, with barely perceptible hairs posteriorly; posterior aspect inconspicuously coriaceous, with the median carina faintly developed on lower half or less. First tergite with its preapical band abruptly impressed on anterior border, not much expanded laterally, marked posteriorly by a moderately regular row of clearly outlined primaries. First sternite with lateral grooves on posterior half and a faint median keel anteriorly. Tergites 3 to 5 with rather fine, poorly outlined punctures; impunctate margin medially scarcely three times width of largest adjacent primary punctures. Length, 5 to 6.5 mm.

The male differs from *asevicæ* in having the preapical band wider and shallower, with its posterior punctures much less coalesced, and from *malayana* in having the front, mesepisternum, and tergites less strongly shagreened, the punctures of the median vertical patch denser and less clearly outlined, the primaries of the mesepisternum less numerous, the secondaries more numerous, and the radial cell less conspicuously extended.

Distribution.—Hyogo, Kanagawa, and Iwate, Japan; Keikido, Chosen; Fukien, China.

The foregoing notes are based upon a selected female specimen from Suigen, Chosen, July 25, 1923 (Sato), Clausen No. 1852, not reared, and on the following specimens in the collection of the United States National Museum and the Japanese Beetle Laboratory: From Yokohama, Japan, 8 females, May 17, 1920 (Clausen), Clausen No. 1382; 1 male, September 15, 1921 (Clausen). From Morioka, Japan, 3 females and 3 males, August 20, 1920 (Clausen). From Kowai, Japan, 4 females, August, 1926. From Koriyama, Japan, 3 females, June 14, 1920 (Clausen). From Suigen, Chosen, 4 females, August 8, 17, and 21, 1922 (King); 5 females, July 25, 1923 (Sato), Clausen No. 1852; 7 females, August, 1923 (Clausen); 2 females, August 10 and 12, 1924 (Gardner), Gardner No. 1 equals Clausen No. 1852; 23 females, August, 1925 (Gardner), used in breeding, Gardner No. 1; 1 female, August 12, 1925 (Sato), Gardner No. 1; 1 female, September 6, 1925 (Sato), Gardner No. 1; 3 females and 1 male, insectary reared, Riverton Exp. 214; 4 females and 2 males, insectary reared, Riverton Exp. 314. From Kuliang, China, 1 female, August 6, 1925, labelled F 1.

Representative specimens have been deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences. The association of sexes is the result of breeding work. The specimens in Riverton experiment 214 were derived from field-collected females from Suigen, August, 1925, and those in Riverton experiment 314 were derived

from females taken in the same locality in 1926. This species has been known to workers of the Japanese Beetle Project as Clausen No. 1852 and as Gardner No. 1. In the specimens from Kowai, Japan, the median carina of the propodeal areola is present only on the upper half, while in the Chosen form it is usually developed on the upper four-fifths. The females collected by Clausen at Suigen, Chosen, August, 1923, differ from the others in having the tibiae wholly red and the femora broadly castaneous on the inner surface. Although the adults of this species vary but slightly from *asericae*, the biological characters determined by Clausen and Gardner in Chosen serve to distinguish it quite clearly from the latter.

33. TIPHIA VERNALIS Rohwer

Plate 1, fig. 6; Plate 2, fig. 16; Plate 3, fig. 19; Plate 4, figs. 25, 29

Tiphia vernalis ROHWER, Proc. Ent. Soc. Wash., vol. 26, p. 91, 1924.—KING and HALLOCK, Journ. Econ. Ent., vol. 18, p. 356, 1925.—CLAUSEN, KING, and TERANISHI, U. S. Dept. of Agr., Dept. Bull. 1429, p. 40, fig. 28, 1927.—KING, ALLEN, and HALLOCK, Journ. Econ. Ent., vol. 20, p. 369, 1927.

The following descriptive notes are supplementary to the original description.

Female.—Vertex with a broad, median patch of minute punctures extending forward on dorsum for a short distance from the occipital region. Clypeus with its lateral margin nearly straight. Mandibles without an uninterrupted median groove. Punctate portion of the pronotum distinctly narrower at its middle than the impunctate apex; impunctate apex medially, usually with from one to three or more short, indistinct, longitudinal grooves. Metanotum usually with a sparsely bipunctate, shallow, median impression, with its coarser punctures nearly as large as those of the scutellum. Legs with major calcarium of the hind tibia broadest just before the middle; hind basitarsus on the outside with a row of three lanceolate spines, one of which is at apex. First tergite with a small medial patch of minute punctures on anterior slope. Lateral grooves of first sternite present on posterior half or less. Tergites 2 to 4 with wide, impunctate apices, medially at least one-fifth as wide as the punctate portion; no trace of a row of vestigial apical punctures or of a marginal linear groove over the dorsum. Pygidium reticulopunctate on basal two-fifths, the impunctate apex wrinkled but not shagreened; the punctate portion with a well-marked impunctate emargination.

Male.—Vertex usually invaded from behind by dense, minute punctures scattered over an area wider than ocellar triangle. Preocellar area of front with its widest interspaces not quite as wide as an

ocellus; lower front with primary punctures gradually diminishing in size, but without a well-defined bipunctate area. Antennocular distance less than width of antennal fossa. Clypeal extension protruding, with a convex disk; clypeoantennal distance nearly twice the apical width of the clypeal extension. Mesepisternum with primary punctures large and clearly outlined; the secondary punctures sparser than the primaries except on the posterior slope. Apex of scutellum impunctate or minutely punctate, distinctly wider than the lower primaries. Primary punctures of metanotum as large as those of the scutellum. Median carina of the posterior aspect of propodeum usually complete to the upper transverse carina. First tergite with a wide preapical band which is not in a depression, and which consists of large, well separated punctures. First sternite with a polished impunctate disk, a crenulate apical fossa, and numerous deep punctures anteriorly, but lacking a lateral groove or a definite antero-medial keel. Tergites 3 to 5 with impunctate apices as wide at the center as six times the diameter of largest adjacent primary punctures. Hypopygium with its impunctate median stripe widening caudally, and bordered by a tuft of dense, erect, white hairs. Genitalia, in ventral aspect, with the outer clasper abruptly constricted near the middle, the outer edge nearly straight, the inner angle broadly crenulate; second genital segment with the apical hook broadly spatulate, the inner hind margin sloping abruptly, without marked convexity or angles; distal portion of aedeagus with the apical lobes very slender, much narrower than the broad lateral processes; proximal portion of aedeagus tapering gradually from near base toward constriction.

Distribution.—Keikido, Chosen; Musashi, Kanagawa, Japan; Kiangsu, Kiangsi, and Chekiang, China.

The above descriptive notes are based on a study of the type series including specimens of both sexes from Suigen, Chosen, and Oiso, Japan, in the United States National Museum, and of the following specimens in the collection of the United States National Museum and the Japanese Beetle Laboratory: From Yokohama, Japan, 1 female and 2 males, April 24 and 25, 1921 (King); 1 female, May 1, 1921 (King); 2 males, May 5, 1921 (King). From Suigen, Chosen, 5 females, June 15, 1923 (King); 2 females, May 25, 1924 (Sato), No. 7; 3 females and 37 males, reared, Riverton, 1925, Exp. 28; 2 males, May 20, 1926 (Gardner); 170 females, May 15–30, 1926 (Gardner); 2 females and 1 male, insectary reared, Riverton No. 230. From Asakawa, Japan, 1 female, June 15, 1920 (Clausen), Clausen No. 1380, Roh. No. 4. From Kuling, China, 1 male and 12 females, May 15–June 23, 1926 (Wong). From Sungkiang, China, 20 males,

April 30–May 5, 1926 (Ren). From Yehzah, China, 1 male, April 28, 1926 (Ren). From Hangchow, China, 1 female, April 24, 1925 (Chao); 1 female, May 15, 1925 (Chao); 2 females, 1925; 1 male and 2 females, April 14, 1926 (Jaynes); 1 male, April 19, 1926 (Chao); 35 females, April 15–May 13, 1926 (Chao); 1 female, April 29, 1926 (Jaynes), Exp. Nos. 204–3; 2 females, Exp. 120; 7 females, May 5–9, 1926 (Chao). From Zakow, China, 3 males and 37 females. No labels, 5 males and 1 female. Representative specimens have been deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences. In the collection of the United States National Museum, 3 females, Asakawa, Japan, June 15, 1920 (Clausen), Clausen No. 1380, Rohwer No. 4 have been referred to this species.

Nearly all the material from Suigen, Chosen, and much of that collected early in May, 1926, by Chao at Hangchow, China, is marked by having grooves on the medio-dorsum of the impunctate apex of the pronotum, by having directly above the antennal fossae a group of 30 or more punctures which are much larger, more angular, and closer together than the others, with linear interspaces, and by having the bend in the first abscissa of the radius distinct and nearly or quite equal to one-third the distance to the first intercubital vein, and with the second intercubital vein strongly bent at the middle. Nearly all the specimens from Zakow, China, and some from Hangchow, China, which were collected on the same dates as the above, differ in being noticeably smaller, in lacking the median groove on the pronotum, in having the punctures immediately above the antennal fossae scarcely larger than others on the front, and with a cluster of at most one dozen crowded and angulate punctures with linear interspaces, in lacking the distinct bend of the first abscissa of the radius, which, if present, is scarcely more than one-fourth the distance to the first intercubital vein, and with the second intercubital vein nearly straight. Between the two extremes there are specimens from a number of localities which show many degrees of intergradation. For this reason, and because all available biological data show no striking differences among the forms included here, it has been decided to include all forms within the same species.

In two males, one without a label and the other from Hangchow, China, April 15, 1924 (Chao), the clypeal extension is more nearly truncate, and is scarcely half as wide apically as the clypeoantennal distance. The impression on the outside of the tegula does not end as abruptly as in the specimens from Chosen, and the punctures of the preocellar area are noticeably sparse. However, these specimens should probably be considered as mere variations from the typical *vernalis*.

34. *TIPHIA MATURA*, new species¹

Female.—Vertex strongly shagreened; punctures of first-degree density occurring in patches behind ocellar triangle and near eye orbits, the broad, irregular intervening space impunctate except for several sparse secondary punctures; minute punctures extending forward from occipital area toward ocellar triangle in a narrow, interrupted band. Front shagreened, with faint carina, well-developed median groove, and impunctate stripe; primary punctures very large and clearly outlined, everywhere of first degree density except on medial stripe, but densest below, where interspaces average much less than the average diameter of primary punctures. Clypeal extension with its impunctate margin of uniform longitudinal extension, it being two-fifths as great as the clypeoantennal distance. Pronotum with its transverse carina lacking over a considerable part of the dorsum; primary punctures of uniform first-degree density over most of the area, though slightly sparser on lateral disks; no trace of transverse discal band; secondary punctures sparsely distributed; the impunctate area medially, slightly narrower than the punctate. Sides of pronotum with a strong, straight central groove, uninterrupted except for minute rugulae jutting from the upper margin. Metanotum coarsely bipunctate, its primary punctures more than half as large as the largest of the scutellum. Metasternum with its posterior lateral angles single, in slender points which curve backward at the tips; no depression along the suture; disks sparsely punctate. Major calcarium of hind tibia widest at the bend near the middle; hind basitarsus with a longitudinal groove, and with a group of three or four stout, black, lanceolate spines on the outside, of which one is at the apex. Tegula shagreened. Wings very smoky; second intercubital vein straight, except for a rounded angle at the junction with the radius; stigma small, less than twice as long as broad, joined by radius near its middle. Propodeum with areola subrectangular, twice as long as wide, its carinae of uniform height and width, and bordered by vague grooves; median carina complete or nearly so. Lower portion of sides of propodeum mostly covered by a patch of dense, minute setigerous punctures. Posterior aspect uniformly setulose and feebly coriaceous; median carina flat and low, ranging from present on the lower half only to complete; transverse carina behind the areola densely minute punctate. First tergite with a well-defined preapical band widening toward the sides from a single row at the center, its punctures rather uniform in size and tending to coalesce with each other laterally, the band separated from apex of the tergite by a wide, polished margin. First sternite without sculp-

¹ See *Tiphia* No. 2036, King, Allen, and Hallock, Journ. Econ. Ent., vol. 20, p. 371, 1927.

turing, except for lateral grooves on posterior half, which are sometimes continued anteriorly by irregular, interrupted gouges. Tergites with wide impunctate belts across their middles interrupted medially by sparse punctures; impunctate apices at least one-fourth the punctate width of the tergite. Pygidium rugoso-punctate on upper half; impunctate apex strongly wrinkled and shagreened. Length, 9.5 to 11 mm.

Male.—Vertex with punctures of first-degree density between and behind ocelli forming a well-defined patch on either side of which are nearly impunctate areas crossed by a series of punctures of second-degree density. Front obscurely shagreened, with a vague, medial impunctate stripe; primary punctures rather small, and very densely distributed over lower front and extending on to the preocellar region, and leaving no impunctate interspaces as broad as an ocellus; secondary punctures scarcely as numerous as primaries, extending upward over lower half laterally, but rising higher on center, where they nearly reach the lowest ocellus. Antennocular distance much less than width of antennal fossa. Clypeal extension with its width two-thirds the clypeoantennal distance; apex masked with appressed hairs, acutely emarginate, only the two extreme apical points impunctate. Pronotum with punctures small, shallow, without distinct outlines and largely of third-degree density, without much tendency toward rows; secondary punctures present antero-medially, though difficult to distinguish; side of pronotum weakly striate, with a tapering median groove crossed by diagonal rugulae. Mesepisternum with primary punctures large and not clearly outlined, of first-degree density on upper disk, becoming thinner behind and below; secondary punctures almost lacking, except on posterior slope. Scutellum with impunctate apex not as wide as the lowest primary punctures. Metanotum densely and coarsely punctate, the primary punctures nearly as large as the largest of the scutellum and covering an area exceeding that of the interspaces. Wings hyaline; radial cell exceeding second cubital cell. Propodeum with its areola slightly longer than wide, with moderately converging sides, enclosed area and disk outside of areola reticulate; side, on its lower portion, polished anteriorly, minutely setulose posteriorly; posterior aspect granulate, the median carina complete or nearly so. First tergite with a preapical band having an irregular, impressed anterior border and separate punctures of nearly uniform width on posterior border. First sternite with impunctate, polished disk, coriaceous to sparsely punctate anteriorly, lateral grooves on posterior half, median keel on upper half. Tergites 3 to 5 with punctures sparse, with indefinite hind margins, and with impunctate apex medially six times the diameter of largest adjacent primary puncture. Length, 9 mm.

Distribution.—Assam, India.

Type and allotype.—Cat. No. 41801, U.S.N.M. Type, female, and allotype, male, Shillong, India, Jap. Beetle Par. Exp. 433.

Paratypes.—Deposited in the U. S. National Museum: Thirty-one females and 12 males, Shillong, India, Jap. Beetle Par. Exp. 433. Retained in the collection of the Japanese Beetle Laboratory, and deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences: Two females and 1 male of the same lot to each.

Several females in a lot from Shillong, India, 1926 (Clausen), have the areola somewhat more slender, being slightly over twice as long as wide; otherwise they are like the type.

The association of the sexes has been made through breeding. The specimens labeled "Exp. 433" were obtained at the Japanese Beetle Laboratory from cocoons, which in turn were obtained from progeny of field-collected females at Shillong. This species has been referred to in notes and papers of the Japanese Beetle Laboratory as Clausen No. 2036.

35. TIPHIA PULLIVORA, new species²

Female.—Vertex with primary punctures densest between ocelli, back of ocellar triangle, and between it and the eyes, where they are mostly of second-degree density, very sparse on either side of median patch. Front faintly shagreened on lower half, with impunctate stripe scarcely perceptible; primary punctures densest on lower half, where they are evenly distributed between the eyes, mostly of first-degree density, on upper front mostly of third-degree density without pronounced impunctate spots; hairs on lower half directed strongly outward. Clypeus with its lateral margin slightly convex; length of impunctate margin of clypeal extension nearly equal to one-half the clypeoantennae distance. Pronotum with its primary punctures of uniform size and well differentiated from the secondaries, slightly more numerous at center than on lateral disks; no transverse discal band. Metanotum with vague medial impression, bipunctate, the coarser punctures smaller than those of scutellum. Legs with major calcarium of hind tibia tapering from base; hind basitarsus with two modified spurs on outside, one of them at apex, groove moderately deep, and half the length of joint. Wings faintly smoky. Propodeal areola keystone-shaped, sides slightly convergent, one and one-half times as long as wide, carinae without bordering grooves; median carina on upper two-thirds or more. Lower portion of sides of propodeum faintly striate, with posterior patch of very minute hairs. Posterior aspect of propodeum without sculpturing save the usual lateral coriaceous area, and a poorly defined

² See *Tiphia* No. 2049, King, Allen, and Hallock, Journ. Econ. Ent., vol. 20, p. 370, 1927.

carina on the lower half or less. Preapical band with a single row of closely set but well separated punctures distally, its impression abruptly outlined anteriorly. First sternite polished, without sculpturing except lateral grooves on posterior quarter or less. Tergites 3 to 5 with impunctate apices wider at the middle, where they are at least one-fourth the width of the punctate portion of the tergite. Pygidium uniformly punctate on basal three-fifths, with a large, impunctate emargination; impunctate apex wrinkled, but not shagreened. Length, 6.5 to 7.5 mm.

Male.—Vertex with a small, wedge-shaped invasion of minute punctures from the posterior slope; primary punctures everywhere of third-degree density. Front conspicuously shagreened; punctures of preocellar area of third-degree density with several impunctate spots as broad as an ocellus; secondary punctures rather poorly defined, though as abundant as the primaries in the area to which they are limited, that is, the lowest third directly above the antennal fossae. Antennocular distance equal to about the width of antennal fossa. Clypeal extension with its apical width four-fifths the clypeo-antennal distance; apex shallowly emarginate, with a very narrow impunctate margin. Pronotum with dorsum shagreened; primary punctures with poorly defined margins, and of uniform third-degree density; secondary punctures not very distinct, largely confined to antero-medial region. Side of pronotum faintly striate, without a groove across the center, and almost free of sculpturing. Mesepisternum shagreened; primary punctures small and not clearly outlined, of third-degree density; secondary punctures on upper half somewhat more numerous, thinning out ventrally. Scutellum with impunctate apex, at places wider than the lowest primary punctures. Metanotum with primary punctures barely of first-degree density and nearly as large as the largest of the scutellum. Wings hyaline, with radial cell equalling, or slightly exceeding second cubital cell. Propodeum with areola scarcely one and one-quarter times as long as wide, outline subrectangular, the median carina usually ending before apex of areola; enclosed area flat and shagreened; upper portion of side with its parallel rugae very fine and disappearing posteriorly; lower portion of side shagreened, not densely hairy; posterior aspect with median carina confined to lower half, and uniformly clothed with dense, fine, poorly outlined, setulose punctures. First tergite highly polished, with only sparse, fine punctures medially; preapical band in a broad depression, with its punctures widely separated. First sternite with lateral grooves on posterior fourth; disk polished, impunctate, anterior half sparsely and shallowly punctate, with a pronounced median keel. Tergites 3 to 5 with their punctures fine, rather sparse, with poorly defined margins; impunctate margin me-

dially four to six times the diameter of largest adjacent primary punctures. Length, 6.5 mm.

Distribution.—Assam, India.

Type and allotype.—Cat. No. 41802, U.S.N.M. Type, female, and allotype, male, Shillong, India, Jap. Beetle Par. Exp. 302-0.

Paratypes.—All from Shillong, India. Deposited in the U. S. National Museum: One female and 3 males, Jap. Beetle Par. Exp. 202; 3 females and 45 males, Jap. Beetle Par. Exp. 302-0; 6 females and 25 males. Retained in the collection of the Japanese Beetle Laboratory: One female and 2 males, Jap. Beetle Par. Exp. 302-0. Deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences: In each, 1 female and 2 males of the same lot as the last.

The association of the sexes has been made through the rearing of adults from field-collected cocoons obtained at Shillong (Exps. 202 and 302-0). The males corresponded in abundance and in time of emergence with the females. There were three other species reared from this material, but in very much smaller numbers and at a different time of the year.

This species has been known to workers of the Japanese Beetle Project as Clausen No. 2049.

36. TIPHIA BISECULATA, new species³

Plate 4, figs. 30 and 31

Female.—Vertex with primary punctures of second-degree density delimiting irregular impunctate spaces. Punctures slightly denser medially than on either side. Front polished, with broad impunctate stripe extending up to ocellus; carina and groove usually absent; primary punctures with tendency toward arrangement in irregular rows, frequently with two, and at places more interspaces, exceeding diameter of punctures; precellar area with several interspaces as broad as ocellus. Clypeal extension with clearly defined impunctate apex, the longitudinal extension of which equals two-fifths the distance from apex of clypeus to base of antennae. Flagellum of antenna fulvous beneath. Pronotum with its transverse carina usually complete, though weakly developed; primary punctures of uniform size, and well differentiated from secondaries, much denser medially and in transverse discal band than on lateral disks; secondary punctures numerous medially; punctate portion medially slightly narrower than the impunctate portion. Side of pronotum broadly and weakly striate, usually with one barely perceptible groove in the middle equal to one-half the length of the sclerite, and with numer-

³ See *Tiphia* No. 1851. King, Allen, and Hallock, Journ. Econ. Ent., vol. 20, p. 369, 1927.

ous, scattered, round punctures mostly above the middle. Scutum with its notauli and its anterior medial groove continuous or nearly so. Metanotum with shallow median impression, densely punctate, its largest punctures nearly equalling those of the scutellum. Legs with femora and tibiae of last two pairs bright red; major calcarium of hind tibia widest at bend near middle; groove of hind basitarsus deep, and nearly as long as the joint; outside spines of basitarsus stoutly lanceolate, irregular, from three to seven in number including one at apex. Tegula with outer edge thin and somewhat upcurled. Propodeal areola keystone to vase-shaped in outline, from two to two and one-half times as long as wide; carina not bordered by grooves or transverse ridges, frequently lacking in part; medial carina somewhat broader than lateral carina, and complete; inclosed area apically sometimes reticulate. Lower portion of sides of propodeum minutely striate, not clearly separated from the upper rugose area. Posterior aspect of propodeum glossily setulose at center; narrow medial carina complete to the transverse carina, except for occasional interruptions. First tergite usually with a small, elongate median patch of dense, fine punctures; preapical band not differentiated. First sternite with a lateral groove on posterior half; anterior half with sparse punctures. Tergites with minute, nonsetigerous punctures in a broken line just before the apices; impunctate apex at the middle from five to six times the width of largest bordering punctures. Pygidium densely reticulo-punctate on basal three-fifths; apex wrinkled, outside wrinkles converging along the margin; impunctate area very faintly shagreened at the sides; impunctate emargination very small. Length, 7.5 to 11.5 mm.

Male.—Vertex with primary punctures everywhere of third-degree density. Front with carina and impunctate stripe; primary punctures densely grouped on lower front, preocellar area with punctures irregularly spaced on upper half, with several interspaces as broad as an ocellus; secondary punctures very fine, and more numerous than primaries on lowest third, ascending medially slightly higher than near the eyes. Antennocular distance greater than width of antennal fossa. Clypeal extension with the apical width four-fifths the clypeoantennal distance; disk convex; apex shallowly emarginate, with narrow but well-defined impunctate margin, apical points upturned. Pronotum with its transverse carina produced into a prominent angle laterally; primary punctures very small, obscurely outlined, and largely of sparse third-degree density; secondary punctures widely distributed over punctate area, but difficult to distinguish from the primaries. Side striate, with anastomosing rugae anteriorly, but without a distinct groove across the center. Mesepisternum with small, fairly well outlined punctures

of third-degree density; secondary punctures fairly well differentiated, and everywhere much more numerous than the primaries. Scutellum with impunctate apex not as wide as the posterior primary punctures. Metanotum unusually convex, with primary punctures of first-degree density nearly as large as those of the scutellum. Tegula with a very fine, marginal, impressed line. Wings with the radial cell not equaling the second cubital cell. Propodeum with its areola strongly convergent, and from one and one-half to two times as long as wide, longitudinal carinae highest at apex of areola, not bordered by grooves, median carina usually nearly complete, broader than the laterals, inclosed area granular-reticulate; lower portion of sides densely shagreened and not perceptibly hairy; posterior aspect granulate, its median carina usually lacking. First tergite with its preapical band wide, poorly defined, in a broad, scarcely perceptible depression, with the punctures distinctly separated. First sternite with deeply crenulate apical fossa, lateral grooves on posterior third, and distinctly bipunctate, with dense secondary punctures covering the disk. Tergites 3 to 5 with vaguely outlined punctures; impunctate margins at center as much as five times width of the largest adjacent primary punctures. Denticle on fifth sternite small, with its raised edge more nearly parallel to margin than to longitudinal plane. Length, 6.5 to 8 mm.

Distribution.—Shizuoka, Japan.

Type and allotype.—Cat. No. 41803, U.S.N.M. Type, female, Miho, Japan, October 1, 1926, and allotype, male, Miho, Japan, insectary reared.

Paratypes.—All from Miho, Japan. In the collection of the National Museum: Four males and 3 females, June 13, 1920 (Clausen), Clausen No. 1381, Rohwer No. 2; 1 male and 2 females, June 18, 1920 (Clausen), Clausen No. 1381, Rohwer No. 2; 8 females, October 4, 1924 (Ouchi), Clausen No. 1851, Rohwer No. 2; 16 males and 5 females, insectary reared; 6 females, September, 1926 (Gardner), Clausen No. 1851; 198 females, October 1, 1926, 2 males and 18 females, Exp. 303, 1927. Retained in the collection of the Japanese Beetle Laboratory: Four females, October 1, 1926, and 4 males, insectary reared. Deposited in the collections of the British Museum, the Illinois Natural History Survey, and the Philadelphia Academy of Natural Sciences: Four females to each, October 1, 1926, and 1 male to each, insectary reared.

The sexes have been associated through breeding. Specimens labeled "insectary reared" and "Exp. 303" emerged at the Japanese Beetle Laboratory from cocoons shipped from field stations in the Orient. The cocoons were obtained from progeny of field-collected females which are represented in our collection by the series collected

by Gardner in September, 1926. This species has for some time been known to the workers of the Japanese Beetle Project as Clausen No. 1851 and as the "Japanese red-legged Tiphia."

37. *TIPHIA PIGMENTATA*, new species

Female.—Vertex with primary punctures of first-degree density behind ocelli, laterally almost impunctate in spots. Front faintly shagreened below; groove present; primary punctures medium in size, of first-degree density only narrowly along inner orbits and beside ocellar triangle, elsewhere of second-degree or third-degree density; precellar area broad, with several interspaces twice as broad as an ocellus. Clypeal extension emarginate; the impunctate apex limited by a definite row of punctures, its longitudinal extension two-fifths the distance from apex of clypeus to base of antennae. Flagellum of antenna fulvous beneath. Pronotum with transverse carina with broad lacuna dorso-medially, and with primary punctures of first-degree density in antero-medial patch and in a well-defined transverse discal band, of third-degree density, and very sparse on lateral disks; secondary punctures few and widely scattered; medial width of punctate area medially considerably narrower than the impunctate area. Side of pronotum with a somewhat interrupted and variable groove across the center, above which there are scarcely any primary punctures. Metanotum with vague median impression; its rather sparse primary punctures nearly as large as the primaries of the scutellum. Legs black, except the femora of the last two pairs, which are bright red; major calcarium of the hind tibia widest near the middle, where there is a very distinct bend; hind basitarsus with a short, shallow groove and a row of three lanceolate spines on the outside, of which one is at apex. Tegula black to bright reddish, but not thin or transparent. Propodeal areaola shaped like the cross section of a biconcave lens, two and one-fourth times as long as wide; carinae bordered by grooves; median carina extending to lowest eighth. Lower portion of sides of propodeum faintly striate, densely and minutely setulo-punctate on posterior half. Posterior aspect of propodeum with flattened linear carina on lowest three-fifths or more. First tergite with its preapical band of regularly spaced punctures one row wide at center, more or less irregularly expanded at sides, where the anterior margin is somewhat abruptly impressed. First sternite with lateral grooves, which may be interrupted anteriorly, on posterior half; front third shallowly coriaceous to sparsely punctate. Medially, the impunctate margins of the intermediate tergites about six times the width of the largest adjacent primary punctures. Pygidium densely rugoso-punctate on basal half; apex not wrinkled, excepting very faintly

at the sides; the impunctate emargination very broad, usually shagreened. Length, 8 to 10 mm.

Male.—Not known.

Distribution.—Chekiang and Kiangsu, China.

Type.—Cat. No. 41804, U.S.N.M. Female, Zakow, China, June 9, 1925 (Chao), No. 5X.

Paratypes.—All females. Retained in the collection of the Japanese Beetle Laboratory: One Zakow, China, June 5, 1924 (Jaynes). In the collection of the Illinois Natural History Survey: One, Zakow, China, July 23, 1924 (Chao), No. W. In the British Museum: One, Zakow, China, June 9, 1925 (Chao), No. 5W. In the U. S. National Museum: One, Chinkiang, China, July 10, 1924, No. G.

This species bears a superficial resemblance to *biseculata*, from which it may readily be distinguished by the characters given in the key, the sparser punctation of the front, by the presence of a parallel-sided areola having its lateral carinae bordered by grooves, by the lack of minute punctures on the anterio-median region of the first tergite, by the strong tendency of the apical primary punctures of the intermediate tergites to be grouped in transverse bands, and by the presence of a much broader impunctate emargination of the punctate portion of the pygidium.

38. TIPHIA CLAUSENI, new species

Female.—Vertex between, beside, and directly behind the rear ocelli with primary punctures of second-degree density, and irregular impunctate areas on either side of the medial patch. Front with punctations of uniform density on lower half medially and along inner orbits of eyes to vertex, with vague, nearly impunctate areas obliquely below ocellar triangle, with numerous interspaces on upper half as broad as an ocellus. Clypeus with its lateral margin slightly convex; extension with length of its impunctate apex two-fifths the clypeoantennal distance. Pronotum with its transverse carina nearly lacking across the dorsum; primary punctures slightly larger in the poorly defined discal band than elsewhere, and slightly denser medially than on the lateral disks, of first-degree density except on the disks, where they are of third degree; secondary punctures lacking; longitudinal extension of punctate area medially about equal to impunctate, though a small emargination gives the impunctate apex the appearance of being longer. Side of pronotum with a median groove extending nearly to alar angle, but interrupted on upper side by many minute rugae. Metathorax sparsely punctate, the punctures much smaller than the primary punctures of the scutellum. Legs with major calcarium of hind tibia widest at the pronounced bend near the middle; hind basitarsus with groove, on outside with row of

three pricklelike spines, one of which is apical. Prododeal areola subrectangular, from two and one-half to three times as long as wide; carinae bordered by well defined grooves; median carina complete to lowest sixth or more. Lower portion of side of propodeum polished, striate, with barely perceptible hairs on posterior half. Posterior aspect of propodeum with its carina linear, flattened on the top, and complete. First tergite with preapical band of a single row of well separated punctures at center, expanding laterally to coalesced patches in which the anterior edge is abruptly impressed. First sternite with lateral grooves extending, with frequent interruptions, to near anterior apex; disk almost bare, highly polished, with strongly light-reflecting medial convexity. Tergites 2 to 4 rather finely punctate, with broad, nearly impunctate discal spaces; impunctate apices medially many times as wide as the largest adjacent primary punctures. Pygidium finely and densely reticulo-punctate on the basal half; impunctate emargination very broad; apical impunctate portion not perceptibly wrinkled. Stylet sheath and palps usually not extruding beyond tip of abdomen when in repose. Length, 8 to 9 mm.

Male.—Not known.

Distribution.—Assam, India.

Type.—Cat. No. 41805, U.S.N.M. Female, Cherrapunji, Assam, India, April, 1926 (Clausen).

Paratypes.—In the collections of the National Museum, the British Museum, the Illinois Natural History Survey, the Philadelphia Academy of Natural Sciences, and the Japanese Beetle Laboratory: One each of the same lot as the type.

This species closely resembles the Zakow series of *vernalis*, but differs in the following characters: It has no patch of minute punctures dorso-medially on the vertex; the mesonotum lacks the median impression and has finer punctures, the first tergite lacks the medial patch of dense, minute punctures, the impunctate apices of the intermediate tergites are wider, and the impunctate apex of the pygidium is not wrinkled. The species is apparently closely related to *pigmentata* also, and differs from it in having black legs, in the denser punctation of the front, the deeper, more frequently interrupted central groove of the side of the pronotum, and the finer punctures of the metanotum and the intermediate tergites. The specimen in the Japanese Beetle Laboratory has the lateral and medial grooves of the scutum continuous.

39. *TIPHIA LONGITEGULATA*, new species

Female.—Vertex with punctures of second-degree and third-degree density, not denser medially. Front with its impunctate stripe poorly defined; primary punctures very sparse above, much

denser on lower half, where they are evenly distributed and of first-degree density between the eyes. Clypeus with its lateral margin convex; extension decidedly truncate and usually red; longitudinal extension of impunctate apex equal to two-fifths the distance from apex of clypeus to base of antennae. Antenna with the apex of the first joint, the entire second and third joints, and the central portion of the other joints reddish brown. Pronotum with its primary punctures rather sparse, especially on lateral disk; transverse discal band not clearly differentiated; secondary punctures absent or nearly so; medial extension of the punctate area about equal to that of the impunctate area. Side of pronotum usually with a groove across the center which is often surrounded by shorter, shallower grooves or irregular punctures which make it inconspicuous. Scutum with its notauli and its anterior medial grooves continuous. Scutellum with a broad, shallow groove on the sides. Metanotum with minute punctures on its borders much smaller than those of scutellum. Legs with the tarsi and apices of tibiae reddish; major calcarium of hind tibia tapering both ways from near middle; hind basitarsus with a very short, shallow groove, and outside with three short, lanceolate spines, one at apex. Tegula red, transparent, highly polished, two times as long as wide, with inner hind corner conspicuously produced. Wings slightly smoky. Propodeal areola rectangular in outline, twice as long as wide, carinae high and uniform, with well developed bordering grooves; median carina on upper three-fourths; enclosed area flat and finely granulate. Lower portion of sides of propodeum striate. Posterior aspect of propodeum faintly coriaceous along upper margin; median carina usually absent. First tergite with a well-defined preapical band, sometimes interrupted in center, but expanded into a patch on each side, abruptly depressed anteriorly. First sternite with faint, diagonal wrinkles apically; disk not sculptured; lateral grooves extending to anterior apex. Tergites with very shallow punctures. Pygidium densely and uniformly punctate on basal half; impunctate apex scarcely wrinkled. Length, 7 to 7.5 mm.

Male.—Vertex with punctures back of ocelli of sparse third-degree density, scarcely denser than on the sides of the vertex. Front with its preocellar area wide and deep, with wide impunctate interspaces nearly twice the width of an ocellus; secondary punctures not apparent. Antennocular distance about equal to width of antennal fossa. Clypeus abruptly tilted at an angle to the plane of the face; extension with its margin truncate, broadly impunctate, sometimes reddish, its apical width scarcely equal to the clypeoantennal distance. Antenna with the apex of the pedicel and the flagellum beneath reddish. Pronotum sparsely coarse-punctate, with primary punctures of third-degree density; area back of transverse carina with unusually

long, sharply defined crenulae. Sides of pronotum irregularly rugose-striate, with a central groove not well differentiated from the striae. Mesepisternum with round punctures having clear outlines, of sparse third-degree density; almost devoid of secondary punctures on outer upper disk; posterior border with a premarginal groove. Scutellum with impunctate apex not as wide as the lowest primary punctures. Metanotum sparsely punctate, the punctures not nearly as large as the largest of the scutellum. Tibiae and tarsi partially reddish. Tegula twice as long as wide, very thin, semitransparent, and reddish at the margin. Wings hyaline; radial cell somewhat exceeding the second cubital cell. Propodeum with its areola strongly convergent, the bordering carinae strongest at its apex, the median carina usually confined to the upper half, the inclosed area strongly reticulate; posterior aspect without definite medial carina. First tergite with a well-defined preapical band which is narrow at the center and widely expanded at the sides, the punctures not extensively coalesced. First sternite mostly polished, impunctate, with lateral grooves on posterior half and vestigial median keel anteriorly. Intermediate tergites with the punctures very small, deep, and round; the impunctate margins at most five times the width of largest adjacent primary punctures; extreme apices of tergites 3 to 6 with a vestigial row of minute non-setigerous punctures over the dorsum. Denticle with its elevated edge nearly parallel to the longitudinal plane. Length, 5 to 5.5 mm.

Distribution.—Fukien, Kiangsu, and Chekiang, China.

Type and allotype.—Cat. No. 41806 U.S.N.M. Type, female, Kuliang, China, August 29, 1926 (Jen); allotype, male, Kuliang, China, August 4, 1926.

Paratypes.—Retained in the collection of the Japanese Beetle Laboratory: One female and 1 male, Kuliang, China, August 4, 1926 (Jen). Deposited in the British Museum: One female, Kuliang, China, 1926 (Jen), and 1 male, Kuliang, China, September 8, 1926 (Jen). Deposited in the collection of the Illinois Natural History Survey: One female, Kuliang, China, 1926 (Jen). Deposited in the collection of the Philadelphia Academy of Natural Sciences: One female, Kuliang, China, 1926 (Jen). Deposited with the United States National Museum: From Kuliang, China, 1 male and 1 female, August 4 and September 27, 1926 (Jen), 1 female, August 28, 1926 (Jen), and 6 females, 1926 (Jen); from Chinkiang, China, 1 female, July 5, 1925 (Wong); from Hangechow, China, 4 females, July 11–20, 1926 (Chao).

The association of sexes in this species was made from collecting data, males and females having been collected together at Kuliang, China. This association is substantiated by the peculiar, very long tegulae which occur in both sexes. Two females and one male from

Kuliang, China, August 4, 1926 (Jen), which were determined as of this species but are not included among the paratypes because of their poor condition, are retained in the collection of the Japanese Beetle Laboratory.

40. *TIPHIA LATISTRIATA*, new species

Female.—Vertex with a narrow row of minute punctures extending from posterior declivous portion to the ocellar triangle; primary punctures of first-degree density back of ocelli and near upper portion of eye, with irregular, nearly impunctate intervening spaces. Front shagreened near lower part of eye, with well-developed median groove; primary punctures very irregular in size, denser on lower half, but scarcely denser medially than toward eyes; precellar area broad, but with scarcely any interspaces as wide as an ocellus. Pronotum with its transverse ridge lacking on narrow median portion, but strongly developed laterally; primary punctures of dorsum uniform in size, and clearly differentiated from secondaries, more numerous medially and in a line just anterior to impunctate apex than on disk laterally, punctate portion medially distinctly narrower than the impunctate portion. Side of pronotum broadly and deeply rugose across center, without a well-defined median groove. Metanotum depressed at center, sparsely bipunctate, the primary punctures large, but scarcely half as large as the largest punctures on the scutellum. Legs with major calcarium of the hind tibia broadest just before center; hind basitarsus with a deep groove, outside with three or four lanceolate shaped spurs in a single row, one at apex of basitarsus. Wings faintly smoky. Propodeal areola keystone-shaped, two and one-fourth times as long as wide, carinae sharp and narrow, not bordered by grooves or transverse ridges; medial carinae usually confined to upper half or three-fifths. Lower portion of sides of propodeum fine wavy-striate, with numerous barely visible hairs posteriorly. Posterior aspect of propodeum with its median carina complete and bordered on the side by two parallel grooves. First tergite with a small, elongate patch of dense, minute punctures on its anterior slope; preapical band consisting of a single row of poorly defined, sparse punctures in a depression abruptly sunken on the anterior border. First sternite with lateral grooves on posterior half of sides; disk unsculptured, except for scattered shallow punctures on sides toward the apex. Tergites 2 to 4 with apical punctures differentiated into a definite band that is separated from the other punctures by a nearly impunctate area, and from the apex by several times the width of band at the middle. Pygidium densely and uniformly reticulo-punctate on basal three-fifths, with a small, impunctate emargination; apex conspicuously wrinkled and shagreened. Length, 11.5 mm.

Male.—Not known.

Distribution.—Keikido, Chosen; Iwate, Japan.

Type.—Cat. No. 41807, U.S.N.M. Female, Suigen, Chosen, August, 1923 (Clausen), Rohwer No. 12.

Paratypes.—Deposited in the collections of the British Museum, the Illinois Natural History Survey, the Philadelphia Academy of Natural Sciences, and the Japanese Beetle Laboratory: To each, one of the same series as the type. In the United States National Museum: Eleven additional females, Suigen, Chosen, August, 1923 (Clausen), Rohwer No. 12, and 1 female, Kowai, Japan, August, 1926.

41. *TIPHIA MINUTOPUNCTATA*, new species

Female.—Vertex with patch of primary punctures back of ocellar triangle denser than on either side or even between ocelli, yet of only third-degree density. Front with distinct groove; primary punctures scarcely as dense medially as on either side, largely of second-degree density, of first-degree density only narrowly along eye orbits, with numerous interspaces on upper half as broad as an ocellus. Third antennal joint distinctly longer than its greatest width. Impunctate margin of clypeal extension not defined by an even row of punctures above, its longitudinal extension about one-third the clypeoantennal distance. Pronotum with its transverse ridge complete and sharply erect at center; primary punctures somewhat larger and denser in the transverse discal band, where they are of first-degree density, elsewhere of third degree, though more sparse on lateral disks than medially; secondary punctures sparse apico-medially; punctate portion narrower medially than the impunctate. Metanotum shallowly impressed at center, with its sparse primary punctures smaller than the largest of the scutellum. Legs with major calcarium of the hind tibia widest just before middle; hind basitarsus with groove, on outside with irregular group of from six to eight stout spines, one of which is apical. Tegula with inner hind corner somewhat produced. Wings nearly hyaline. Propodeal areola rectangular, two and one-half times as long as wide; carinae bordered by grooves; median carina extending to lowest fifth. Lower portion of sides of propodeum faintly striate and densely and minutely setulo-punctate on posterior half. First tergite sometimes with patch of minute, setigerous punctures medially; preapical band of irregularly spaced but well separated punctures about two rows wide at center. First sternite with lateral grooves on posterior third, with interrupted continuations anteriorly, otherwise scarcely sculptured. Tergites 2 to 4 with the punctures medially in a well defined band which is narrower than the distance from the band to the apex, the impunctate apex medially being at least as wide as six times the diameter of the adjacent pri-

mary punctures. Pygidium densely reticulo-punctate on basal three-fifths; apical section plainly wrinkled longitudinally on either side of the impunctate emargination. Length, 11 mm.

Male.—Not known.

Distribution.—Kiangsi, China.

Type.—Cat. No. 41808, U.S.N.M. Female, Kuling, China, July 11, 1926 (Wong).

Paratype.—Retained in the collection of the Japanese Beetle Laboratory: One female of the same lot as the type.

The sting sheaths of the two specimens examined are unusually exerted to distance equal to width of pygidium, and the two associated accessory processes for nearly half the distance. Whether this condition is normal or not can not be stated, but if so it furnishes a rather good diagnostic character.

42. TIPHIA NANA, new species

Male.—Vertex with punctures small, poorly outlined, everywhere of third-degree density, though denser back of ocellar triangle and near the eyes. Front faintly shagreened below; primary punctures clearly outlined, nearly everywhere of third-degree density except near the lower eye orbits; preocellar area broad, with interspaces laterally at least twice the width of an ocellus; secondary punctures not apparent. Antennocular distance less than the width of antennal fossa. Clypeal extension with its apical width one and one-fourth times clypeoantennal distance, abruptly emarginate, sparsely coarse-punctate to apex, disk slightly convex. Pronotum with its dorsum sparsely punctate with small primary punctures of uniform third-degree density, the impunctate hind margin nearly reaching the transverse carina medially; secondary punctures lacking; side with a faint, curved groove extending two-thirds the distance to alar angle. Mesepisternum sparsely fine-punctate, with secondary punctures not clearly differentiated on the outer, convex disk. Scutellum with impunctate apex nearly as wide as the largest primary punctures. Metanotum with apical callosity, its sparse primary punctures as large as the largest on the scutellum. Wings hyaline; radial cell greatly exceeding second cubital cell. Propodeum with its areola convergent and straight-sided, length one and one-half times its width, enclosed area smooth and flat; side with its upper portion scarcely rugose, not clearly differentiated from the lower shagreened portion. First tergite with a preapical band in a shallow concavity marked posteriorly by a single row of small, poorly outlined primary punctures. First sternite not coriaceous, with lateral grooves on posterior half and a strong median keel on anterior half. Intermediate tergites faintly shagreened; the primary punctures very small

and poorly outlined; impunctate apices at middle about one-fourth the punctate width. Lateral denticle of sixth sternite very small and appressed. Length, 5.5 mm.

Female.—Not known.

Distribution.—Fukien, China.

Holotype.—Cat. No. 41809, U.S.N.M. Male, Kuliang, China, August 4, 1926 (Jen).

SUPPLEMENTARY NOTES ON TYPES OF ORIENTAL TIPHIA IN THE BRITISH MUSEUM

During the winter of 1927–28, while the work on this paper was in progress, Mr. Gahan, who at the time was in Europe examining types of Hymenoptera, was asked to compare examples of our material with the extensive collection of types in the British Museum. For this purpose, determined specimens of nearly all the species represented in the material being studied were sent to him, together with our keys to species. The junior author also had studied these types during the preceding winter, but he had none of our material with him for comparison. Though it should be pointed out that our ideas as to species have been clarified considerably since these examinations were made, and the keys upon which Gahan based his determinations have been considerably altered, the following notes are valuable as an aid in associating species previously described with species described in this paper.

TIPHIA PUNCTATA Smith

Tiphia punctata SMITH, Trans. Ent. Soc. London, 1873, p. 183.

Described from a male from Hyogo, Japan. The notes by Gahan make it clear that this species belongs to the *koreana* group, in which the first tergite has the very deep preapical groove broadly overlapped on the dorsum. It could not be *antigenata* or *communis*, since both have conspicuous, short, erect, brown pile on the tergites, while *punctata* Smith is entirely devoid of such pile, both on the tergites and on the sternites. *T. ovidorsalis* could probably be eliminated as a possibility, although the erect, brown pile in this species is much sparser, and, in some specimens, might easily be overlooked. No other males are known in this interesting group, although several of the species are known in the female sex, including two species from Japan, *tegitiplaga*, and *autumnalis*.

TIPHIA ROBUSTA Cameron

Tiphia robusta CAMERON, Ann. Mag. Nat. Hist., ser. 7, vol. 13, 1904, p. 283.

Originally described from a female, from northern India. In the British Museum there is one female, not the type, determined as of

this species and labeled Burma; whether the determination is correct is not known. The following notes by Gahan indicate that it is quite different from other species described in this paper. In our key it runs to couplet 21, but is quite different from either of the species included there. Only the hind femur is red. The pygidium is sculptured like that of *totopunctata*, although it is somewhat smoother at the apex, and is thickly studded on the punctate portion with dark colored, nearly black, long, stiff setae which are distinctly thicker and stiffer than those usually found on this tergite. The fourth and fifth tergites each have a double row of similar bristles at the apex. The forewings are unusually dark: nearly black. The first tergite has a transverse row of coarse, shallow punctures at the angle between the anterior and dorsal aspects, these punctures producing a distinct, though slightly irregular fold at the anterior margin of the tergite.

TIPHIA CLYPEALIS Cameron

Tiphia clypealis CAMERON, Mem. and Proc. Manchester Lit. and Philos. Soc., vol. 41, no. 4, 1896-97, p. 47.

The type male, from Masuri, would undoubtedly run out to the *rufomandibulata-notopolita* complex, as it did in the provisional key used by Gahan. He notes that in this species the clypeus is differently colored and the body much more hairy.

TIPHIA CARBONARIA Smith

Tiphia carbonaria SMITH, Journ. Proc. Linn. Soc. London, Zool., vol. 5, 1861, p. 78.

There is a female from Malaya, not marked type, in the British Museum. It would run to couplet 6 in our key, but its course from that point is uncertain. Gahan found that it differed from *rufomandibulata* in being distinctly larger, in lacking crenulae along the dorsal apex of the propodeum, in having the median carina of the propodeal areola ending abruptly just before the apex, in the more definite limitation between the upper rugose portion and the lower shagreened portion of the sides of the propodeum, and in the absence of linear marginal grooves on the tegula. The continuity of the lateral and of the anterior grooves of the scutum would separate it at once from the other species under couplet 6, including *lyrata*, *brevicarinata*, *sternocarinata*, and *notopolita*.

TIPHIA STIGMA Smith

Tiphia stigma SMITH, Journ. Proc. Linn. Soc. London, Zool., vol. 2, 1858, p. 91.

Three females from Borneo, none marked type, are in the British Museum. Gahan notes that quite possibly these represent different

species. He found that one differed from *carbonaria* only slightly, having darker wings, having the joints of the flagellum, except the last, not longer than broad, while those of *carbonaria* are all a little longer than broad, and having the punctures of the pygidium somewhat finer.

TIPHIA FUMIPENNIS Smith

Tiphia fumipennis SMITH, Journ. Proc. Linn. Soc. London, Zool., vol. 2, 1858, p. 90.

A female from Borneo, not marked type, is in the British Museum. Gahan finds that this species would run to couplet 6, and that it is like *carbonaria*, but differs markedly from it and other related species in having the ocellular line hardly equal to twice the greatest width of an ocellus, while in other species it is three or four times as long. The ocelli appear to be unusually large and the eyes more than ordinarily convergent above. The propodeum is unusually long, being nearly, if not quite, two-thirds as long down the middle of the dorsum as broad at the apex of the dorsum. The preapical row of punctures on the first tergite is very weak, and the whole tergite is weakly punctate to a noticeable degree, with unusually small punctures; the disk of the second tergite medially from base to apex is almost impunctate except for a few sparse, very weak punctures, even the preapical row being subobsolete. Gahan's notes appear to differentiate this species quite sharply from other species discussed in this paper.

TIPHIA BORNEANA Cameron

Tiphia borneana CAMERON, Entomologist, vol. 40, 1907, p. 288.

A single male from Borneo, marked type, is in the British Museum. Gahan finds that it agrees in many characters with our specimens of *malayana*, but the following differences are noted, which undoubtedly separate it not only from *malayana* but from the other species in our keys. The radial cell is pointed at its apex, the radial vein joining the metacarpus at the margin of the wing in a sharp angle, without the usual backward or upward curve found in *malayana*. The second cubital and second recurrent veins also are more nearly interstitial. The pronotum is almost impunctate, but has a very few subobsolete punctures. The propodeum is shagreened and is similar to that of *malayana*, but lacks the crenulae or rugae bordering the transverse carina and the longitudinal carinae that form the sides of the areola. The first tergite is almost impunctate, the transverse preapical groove is present but impunctate; the second tergite is almost impunctate and is polished; the following tergites are finely shagreened, and have weak punctures.

TIPHIA AURIPENNIS Bingham

Tiphia auripennis BINGHAM, Fauna Brit. India. Hymenop., vol. 1, 1897, p. 64.

The material in the British Museum includes a female, the type of *auripennis*, and a female, the type of *curvinerva* Cameron, which is considered to be conspecific. Both are from Assam, India. Gahan states that in the key sent to him *auripennis* ran to our species *inconspicua*, and it probably would do the same in the present key. He stated, however, that it was not identical with *inconspicua*.

TIPHIA ANNANDALEI Turner

Tiphia annandalei TURNER, Ann. Mag. Nat. Hist., ser. 8, vol. 2, 1908, p. 123.

Described from the female type in the British Museum, labeled Siam; probably from Selangor, on the West Malay Peninsula. Gahan runs this species to couplet 30 of our key. He says that it resembles *phyllophagae* more or less, but has the apical half of the pygidium very strongly shagreened and with a few wrinkles (not striations as in *totopunctata*). The clypeus is squarely truncate at the apex, the truncate margin of the extension reaching a point outside the antennal fossa. The last character is quite different from any possessed by the other species included in couplet 30, namely, *nervidirecta*, *popilliavora*, *phyllophagae*, and *ovinigris*. The species is apparently different from any discussed in this paper.

TIPHIA IMPLICATA Cameron

Tiphia implicata CAMERON, Mem. and Proc. Manchester Lit. and Philos. Soc., vol. 41, no. 4, 1896-97, p. 50.

The type, a male from "Masuri," would very likely run to *popilliavora* in our key, as it did in the provisional key used by Mr. Gahan. He found that it differed from the latter in having the front more densely punctate and beset with longer and more numerous hairs.

TIPHIA FUSCINERVIS Cameron

Tiphia fuscinervis CAMERON, Mem. and Proc. Manchester Lit. and Philos. Soc., vol. 41, no. 4, 1896-97, p. 48.

Described from the female from "Mussouri." In the British Museum there are two males and one female, not labeled types, from the "Kanga Valley." Gahan considers these to be the same as our species *capillata*, as he found no differences except the following colorational variations. The tibiae are not bright red, but have a decided reddish cast. In the males, the first two pairs of tibiae are red, but the hind pair is darker. Although our species *capillata* may equal *fuscinervis*, we hesitate to state that it does without having examined the type.

TIPHIA RUFIPES Smith

Tiphia rufipes SMITH, Cat. Hymenop. Insects in Coll. Brit. Mus., pt. 3, 1855, p. 83.

The type, a female labeled "N. India," runs in our key to *capillata*, but differs in having all the femora as well as the tibiae bright red. Gahan notes also that the pygidium is nearly devoid of shagreening, while that of *capillata* is rather strongly shagreened.

TIPHIA ORDINARIA Smith

Tiphia ordinaria SMITH, Trans. Ent. Soc. London, 1873, p. 184

This species comes close to *bicarinata*, and may possibly be a variety, though it is probably another species. The type is a male from Hyogo, Japan, while the type of *bicarinata* is a female, also from Japan. It differs from our males of *bicarinata* in not having dark-colored hairs on the apical tergites, in having distinct lateral grooves on the lower half of the first sternite, and in having a radial cell exceeding the second cubital cell. An occasional specimen of our lot of *bicarinata* has lateral grooves on the lower third of the first sternite, but most have none. In *bicarinata*, the radial cell is actually only equal to the lower corner of the second cubital cell, although the oblique trend of the intercubital cell gives the radial cell the appearance of exceeding the second cubital.

TIPHIA SPINOSA Cameron

Tiphia spinosa CAMERON, Entomologist, vol. 35, 1902, p. 237

Described from a male from Khasia (Hills), India. Mr. Gahan notes that it lacks denticles and orifices on the fifth sternite, which would throw it to couplet 2 in our key, with the alternatives of *bicarinata* and *cilicincta*. The other characters mentioned by him, which serve to separate it from these species, are as follows. The first sternite, exclusive of its lateral folds, is nearly or quite twice as long as its apical width, and is entirely and coarsely rugoso-punctate, the basal half having a strong medial carina which, at its anterior end, is produced downward into a short, hooklike tooth. In *bicarinata*, the first sternite is not nearly twice as long as wide, it is finely punctate on the apical half, the basal carina is vestigial, and the tooth described for *spinosa* is lacking. In *cilicincta* there is a median keel, but the other differences hold the same as for *bicarinata*.

TIPHIA TIBETANA Turner

Tiphia tibetana TURNER, Ann. Mag. Nat. Hist., ser. 8, vol. 2, 1908, p. 121.

In the British Museum there are single male and females specimens, both of which are labeled type. There are also three females and three males labeled cotypes and an additional eight females and one male, Cyangtse, 13,000 feet, which are presumably from the Yangtze River valley in Tibet.

The type female of this species runs to *asericae* in our key, but the tegula differs in being black, and there is no preapical band sunk in a deep, narrow groove. It is somewhat difficult to say where the male type would run to in the present key. It has a tooth on the fifth sternite, the mesepisternum is not conspicuously bipunctate at the center of the disk, and the apex of the radial cell does not exceed the second cubital cell. It does not belong to any species in the *koreana* group, since it lacks the deep, overlapped groove just before the apex of the first abdominal segment. It also lacks the coarse, apical, ciliate row of bristles on the intermediate tergites, which are characteristic of the *bicarinata* group. This combination of characters would eliminate all species in our key except *pullivora*, *agilis*, and *asericae*. Gahan writes that the species is not *agilis*, but just how it differs from *agilis* and the other two species is not known.

TIPHIA CONSUETA Smith

Tiphia consucta SMITH, Descriptions of New Species of Hymenoptera, 1879, p. 184.

The type, a female from Ceylon, was examined in the British Museum by Gahan. He says that it runs in our key to *matura*, but can be separated from that species. The wings are not nearly as dark. The front and vertex appear much less strongly shagreened on the interspaces. The pronotum is less densely punctate anteriorly, and the punctures are somewhat coarser.

TIPHIA KHASIANA Cameron

Tiphia khasiana CAMERON, Ann. Mag. Nat. Hist., ser. 7, vol. 10, 1902, p. 86.

Described from the female; type locality not given. In the British Museum there is a female from Assam determined by Cameron, but not labeled type, and another female from Assam, which Gahan thinks may not be of the same species. This species runs to couplet 21 in our key, and Gahan writes that it is very similar to both forms included there. He finds that the pygidium is exactly like that of *pigmentata*, and that it is not wrinkled apically as in *biseculata*, that the punctation of front, pronotum, and abdomen is like that of *biseculata*, but is more pronounced than that of *pigmentata*, and that the hind tibiae are darker than those of *biseculata*.

TIPHIA PUNCTIFRONS Cameron

Tiphia punctifrons CAMERON, Entomologist, vol. 42, 1909, p. 175.

The type is a male from Borneo. Gahan notes that it has an elongate tegula exactly like that of *longitegulata*, of which the type is a female, and of which he had only females before him at the time his comparison was made. This character sharply separates the species from all the others discussed in the foregoing part of this paper.

We have males with the same peculiar, elongate tegula, that were taken with the females of *longitegulata* and are without doubt correctly associated. *T. punctifrons* is almost certainly a distinct species, differing in having the mesepisternum conspicuously bipunctate over all its surface, with the primary punctures distinctly larger than the secondaries, and in having the first two pairs of legs to the coxae, and the hind tibiae and femora red.

TIPHIA OSWINI Turner

Tiphia oswini TURNER, Spolia Zeylanica, vol. 7, pt. 27, 1911, p. 152.

Gahan examined the type, a female from Ceylon, in the British Museum. He found that in our key it runs best to *longitegulata*, but is much larger, and is not of that species. The tegula is black, hardly twice as long as wide, though distinctly longer than broad, extending for fully one-third its length beyond the scutellar groove. The first tergite is not as coarsely or strongly punctate; the second tergite is nearly impunctate, except for a transverse, preapical row of punctures and a few very scattered, suberased punctures on the disk. The depressed area of the scutum is much less densely punctate. The median carina of the propodeum is subobsolete, except the basal third; the areola is well defined. The flagellar joints are all somewhat longer than wide; the apical joint is about four times as long as wide.

TIPHIA FLAVIPENNIS Smith

Tiphia flavipennis SMITH, Journ. Proc. Linn. Soc. London, Zool., vol. 2, 1858, p. 91.

Originally described from the female from Borneo. There are three females and two males under this name in the British Museum. The following information regarding them is from Gahan: One female and one male from the Smith collection, taken in Borneo, are identical with other specimens under the name *lyrata* in the British Museum. Waterston says that these are cotypes. One female, also from Borneo, and determined by Cameron as *flavipennis*, agrees with our *longitegulata*, except that it is a little larger and that the tegula is lighter red. One of the males and one of the females belong to still another species.

TIPHIA INCISA Cameron

Tiphia incisa CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc., vol. 41, no. 4, 1896-97, p. 49.

Described from the male from "Missouri." Gahan examined a series under this name in the British Museum, which he noted could be separated into two and possibly three species on the basis of the characters used in our keys.

TIPHIA INTRUDENS Smith

Tiphia intrudens SMITH, Journ. Proc. Linn. Soc. London, Zool., vol. 7, 1864, p. 25.

Originally described from both sexes from "Mysol." Gahan notes that, according to the characters we have used, there are several species under this name in the British Museum.

EXPLANATION OF PLATES

PLATE 1

- FIG. 1. Posterior aspect of mesepisternum of *T. fossata*, female, showing pre-apical groove. *c*, coxa; *me*, mesepisternum; *p g*, preapical groove.
2. Hypopigium of *T. bicarinata*, female, showing medio-apical impunctate stripe.
3. Major calcarium of the hind tibia of *T. popillivora*, female, illustrating the type which is widest near the middle.
4. Major calcarium of the hind tibia of *T. communis*, female, illustrating the type which is not wider at the middle than at the base.
5. Scutum of *T. bicarinata*, female, showing notauli continuous with the antero-medial groove. *a gr*, antero-medial groove; *n*, notauli.
6. Scutum of *T. vernalis*, female, showing notauli not continuous anteriorly with the antero-medial groove. *a gr*, antero-medial groove; *n*, notauli.
7. Section of wing of *T. bicarinata*, male, in which the cubital cell contains a well-defined cubital mark, *c m*.
8. Clypeus of the female, *T. communis*, illustrating the type in which the lateral margin (*l m*) is strongly convex.

PLATE 2

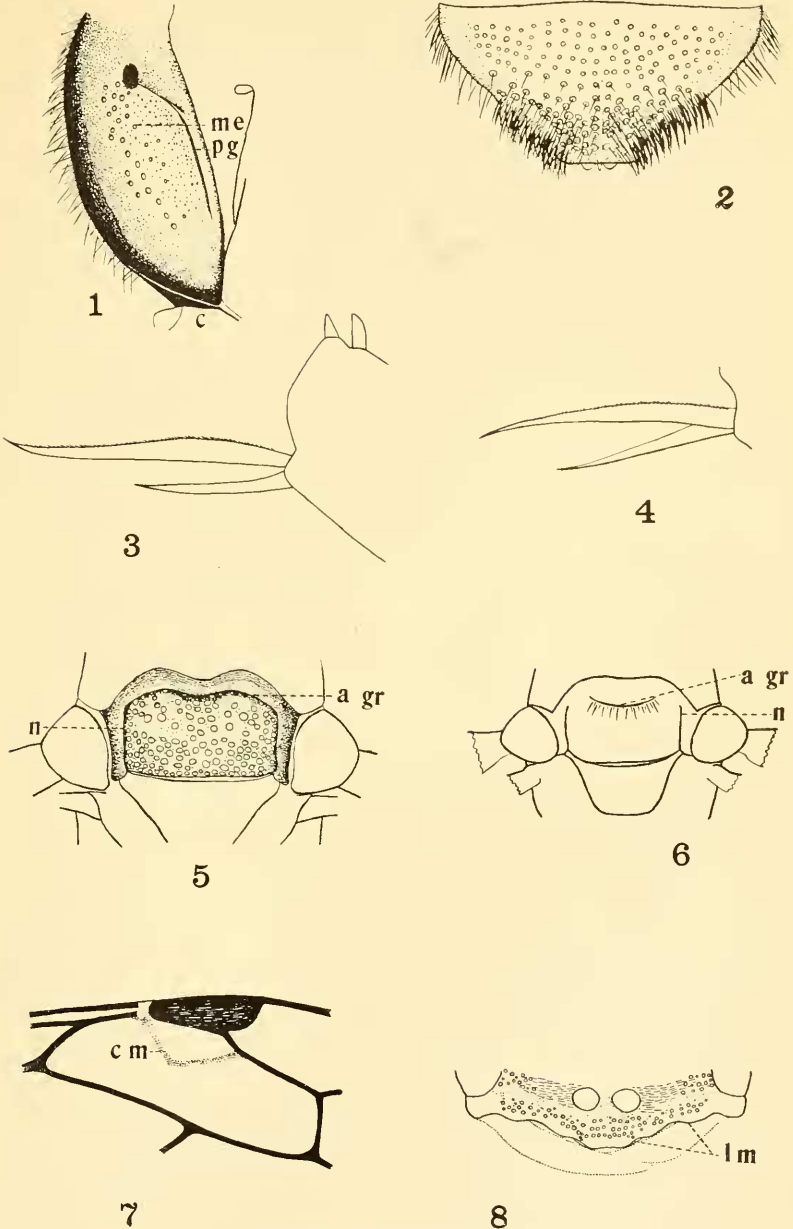
- FIG. 9. Three degrees of density of primary punctures. *a*, first-degree density, in which most of the punctures are separated from three or more adjacent punctures by interspaces equal to or less than their own width; *b*, second-degree density, in which the punctures are arranged in single rows and are separated by interspaces equal to or less than their own width from only two other punctures; *c*, third-degree density, in which every interspace exceeds the width of the punctures.
10. Propodeal areola of *T. fukiensis*, male.
11. Propodeal areola of *T. bicarinata*, female, illustrating the type with "keystone" outline. *d p*, dorso-propodeum; *e*, enclosed area; *l c*, lateral carina; *m c*, medial carina; *p p*, posterior aspect of propodeum; *s*, scutellum.
12. Propodeal areola of *T. lyrata*, female.
13. Propodeal areola of *T. communis*, female, illustrating the type with hastate outline.
14. Propodeal areola of *T. inconspicua*, female, illustrating the type with rectangular outline.
15. First tergite of *T. communis*, female, illustrating the type with a deep preapical fold (*p f*) overlapped at the middle.
16. First tergite of *T. vernalis*, female, illustrating the type having no preapical fold.

PLATE 3

- FIG. 17. Genitalia of *T. phyllophagae*, male. *acd*, aedeagus; *ah*, apical hook of the second genital segment; *al*, apical lobe of the aedeagus; *ic*, inner clasper; *lp*, lateral process of apical portion of aedeagus; *oc*, outer clasper.
18. Genitalia of *T. communis*, male.
19. Genitalia of *T. vernalis*, male.
20. Genitalia of *T. rufomandibulata*, male.
21. Mandible of *T. popilliavora*, female, illustrating the type having median groove (*mg*).
22. Flexor surface of the hind basitarsus of *T. popilliavora*, female, illustrating the type having longitudinal groove and lanceolate spines with one spine of the same type at the apex.
23. Flexor surface of the hind basitarsus of *T. communis*, female, illustrating the type without longitudinal groove, with prickle-shaped spines, and without one of the same type of spines at the apex.
24. First segment of antenna of *T. bicarinata*, female, showing the pronounced angle at the apex.

PLATE 4

- FIG. 25. Portion of wing of *T. vernalis*, male, illustrating the type in which the radial cell (*r*) exceeds the second cubital cell (*scu*) in apical extension.
26. Portion of wing of *T. communis*, male, illustrating the type in which the radial cell (*r*) does not equal the second cubital (*scu*) in its apical extension.
27. Portion of the fifth sternite of *T. popilliavora*, male, showing the lateral denticle (*d*).
28. Portion of vertex of *T. popilliavora*, female, showing the median series of minute punctures (*mp*).
29. Portion of the dorsal aspect of pronotum of *T. vernalis*, female, showing the vestigial median groove (*mg*) on the impunctate apex.
30. Portion of a tergite of *T. biseculata*, female, showing the row of minute vestigial punctures (*vp*) caudad of the usual large, apical punctures.
31. Ventral aspect of first abdominal segment of *T. biseculata*, female, showing the lateral grooves (*lg*) of the first sternite.
32. Pygidium of a female of the type which is punctate on not more than the basal three-fifths, and which has a well-defined impunctate emargination of the punctate portion. *ia*, impunctate apex; *ie*, impunctate emargination.



WASPS OF THE GENUS TIPHIA

FOR EXPLANATION OF PLATE SEE PAGE 103